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THE INSTITUTE OF PETROLEUM

AN Ordinary General Meeting of the Institute of Petroleum was held at 26 Portland Place, London, W.1, on 8 February 1956, the Chair being taken by A. C. Hartley, C.B.E., a Vice-President of the Institute.

The General Secretary read the minutes of the meeting held on 11 January 1956, which were confirmed and signed as a correct record. He also announced the names of members elected since the previous meeting.

The Chairman introduced F. U. J. O'Brien, LL.B., who then read the following paper :

A LEGAL DEPARTMENT IN AN OIL COMPANY*

By F. U. J. O'BRIEN †

INTRODUCTION

IT IS probably quite obvious to most people that the work dealt with by members of a legal department in an oil company with international connexions is likely to be extremely varied. What is probably not so obvious is the additional complications that must of necessity arise when that legal department is part of one of the main operating companies of the Royal Dutch/Shell Group of oil companies. These complications arise, first, because the two parent companies are organized under two different systems of law (and the two systems themselves have different backgrounds) and, secondly, because there are, for varying reasons, a multitude of subsidiary companies which are themselves organized under different legal systems.

As a result, it is necessary for at least one company to carry out co-ordinating and advisory services within the Group and, apart from its other functions, these services are carried out in London by The Shell Petroleum Company Ltd.

Hence, a lawyer working for that company finds himself involved in a wide variety of problems relating not only to the oil business in all its aspects but also to legal corporate relationships of all kinds.

However, no one consults his personal lawyer without expecting that anything he says will be treated with the utmost confidence. The legal department in any organization is in exactly the same position and, consequently, because it is what might be called a " confidential " department, it has knowledge of a number of problems which are not only secret as far as the outside world is concerned but may also be highly confidential within the organization itself and known only to a limited number of people. In consequence, in endeavouring to give a picture of the type of work with which a legal department has to deal, it is necessary to use a rather large canvas and no one can expect a detailed description of some of the matters which come to it.

PART I

Since the lawyers have to be familiar, in one way or another, with all phases of the oil business, it may be of interest if some of those phases are considered and the lawyers' part in them described.

Exploration for and Production of Oil

Before a company can begin its operations, it needs some kind of right or licence from the governmental authorities concerned. Clearly, no organization will commit itself to a very large expenditure of money unless it is convinced that, should it find any oil, it will be able to obtain a reasonable share of the profits that may flow therefrom.

Before it starts to spend any money, therefore, the lawyers are asked to advise regarding its legal rights and its obligations and whether or not it is fully protected. This will involve different considerations in different countries, discussions with foreign lawyers, and an analysis of their opinions.

Some countries have petroleum legislation by virtue of which " concessions " are granted to companies giving them the right to explore for oil and, subsequently, to exploit any oil so discovered. Thus, there may be laws which are contained in the statute book which perhaps in a comparatively simple way appear to cover all the circumstances which may arise in the future. It is unlikely that the lawyers in such cases will be concerned merely to study the petroleum legislation, examine the type of concession to be granted, and advise that, if any document is executed, the company concerned will have the same rights as any other company which might be willing to undertake similar exploration work.

Very many other matters will have to be taken into account. The tax legislation will, not unnaturally, be of first rate importance and it will fall to the lawyers to advise on the effect of the acts not only within the country concerned but also in relation to other countries to which, as is quite likely, it may be necessary to take some part of the income derived from the profits made in the country where exploration is being carried out.

The local customs and excise regulations will also need examination, particularly if it is an undeveloped country into which most of the material required for exploration will have to be imported.

* MS received 16 December 1955.

† The Shell Petroleum Co. Ltd.

Conditions relating to labour will have to be considered, including permits for foreign experts and their rights under the local laws (and their rights under the laws of the country of their origin).

In addition, it is quite possible that certain construction contracts will be made with outside firms, and, among the questions that will arise, will be the law under which these contracts should be made. If, for example, someone is negligent and an accident occurs, who is to be responsible and under what law is it best to operate? Clearly, in such a case the local law will have something to say, but the rights as between the company and the contractor may well be governed by a different law.

All these problems apply in a similar way in the area or country which does not have a fully-developed petroleum legislation or which decides, for other reasons, to make a direct comprehensive contract with an oil company, which contract will itself be the law governing the relations between the parties and which, therefore, must cover all aspects of such relationships. The most recent example of this, and which took, quite apart from any political questions that may have arisen, a considerable time to formulate, is the Agreement with the Government of Iran.

It may be possible for the lawyer concerned, in handling the affairs of his own company, to be reasonably satisfied (he will never be entirely satisfied) with arrangements which his company is to make for the search for oil when his company is acting by itself. But the problem is greatly complicated if the exploration venture is one in which his company is jointly concerned with one or more other companies, especially as it is quite likely that those other companies are not of the same nationality as his own.

He will then be faced not merely with the problems of the local law of the country where the exploration is to take place but also the problems of the domestic law of his own company and that of the other companies—which may well take a different view of any particular circumstance or transaction. He will also be faced with other lawyers, probably of different nationalities, and in the early stages it will appear that only if given two or three years would it be possible to reach some kind of agreement. The fact that such agreement is required within the following two or three weeks is merely an additional problem.

Even if, and, of course, it eventually happens, agreement is reached on the terms and conditions under which the exploration is to be carried out, the problem of co-ordination between the joint venture companies remains to be solved. While this and many related questions are matters of policy to be determined by the boards of the companies concerned, it will fall to the lot of the lawyer to draft the necessary provisions and, having produced a draft, not only to explain to his directors that he has done what is necessary, but also to convince the lawyers of other nationalities that what has been written is not only correct but has been written in the best possible and clearest manner.

As a result, the lawyer is expected to know the local laws (petroleum legislation, tax, land laws, customs and excise laws, and laws relating to personal matters, including the vast subject of pension funds) and his own country's laws and, in addition, to have some knowledge of the laws of other countries that may in some way or another be involved.

While on this subject, it is worth mentioning that there is another with which he will be expected to be familiar and that is the matter of the Continental Shelf. If his company happily exploring on land finds that the oil it is looking for is really under the sea, the lawyer will be supposed to have known this and taken such steps as he can to see that his company is free to explore there as well as on land.

Once the new enterprise is established and the various documents and agreements signed, the lawyer may feel that he is entitled to relax. But frequently, in no time at all, members of various departments in the organization are back in the lawyer's room to enquire the meaning of certain clauses in the documents. No new venture fails to have problems, and for years afterwards the lawyer concerned is kept busy interpreting what has been written, and frequently the written clauses must be applied to new circumstances which had not been contemplated at the time the agreements were signed.

Sale of Oil

Basically, contracts for the sale of crude oil and products are not very different from any other form of sale contract. It is merely a question of a willing seller and a willing buyer but there is, in fact, quite a wide variety of such sale contracts.

There are the very long-term agreements for large quantities. These may have to be written up in the greatest of detail and the rights and obligations of both parties will have to be clearly expressed both as to quantities, in respect of transportation (particularly if it involves shipping) and as to price.

There are the shorter agreements for one or two cargoes of oil where all that is required is the simple statement of facts with one or two formal clauses covering *force majeure*, arbitration, and the law of the contract.

Then there are the international supply contracts relating to ships and aircraft which have to be more carefully watched, even if quantities are comparatively small, since ships and aircraft are liable to turn up anywhere in the world and demand supplies. Supplies are hardly the concern of a legal department, but it is expected to know what will happen—and to provide for it—in the " impossible " case where supplies have run out.

There is the whole question of *force majeure* clauses which are required in all types of contracts but are particularly relevant in sale and purchase contracts. Not many laymen really understand them—for that matter, not many lawyers either—but let there be a hint of a possible disaster, much less an actual one, and the lawyer will find himself invaded by members of

other departments demanding to know if the company is protected in every possible way. The reported English cases on this subject are nearly all extremely lengthy and deal in all instances with a particular set of facts from which one may draw conclusions. But all lawyers are expected to give immediate advice on entirely different facts—some of which are only merely anticipated and may never happen. They are also expected to include in all contracts a perfect *force majeure* clause.

In the sphere of the direct marketing of products to the general public there is another type of work. Arrangements are required for service stations, dealer contracts, and agencies of all kinds, and not infrequently there are difficult problems of trade-mark infringement and passing off, not only in the U.K. but wherever in the world the branded product may be sold.

Refining of Oil

It may be decided to build a refinery, in which event construction contracts must be examined. Before this can be done, it may be necessary to negotiate with the local governmental authorities. Even if the lawyer is not taking a personal part in the negotiations with the government concerned, he must be on the spot with all the up-to-date information so that he is ready to prepare, discuss, and amend the various drafts that will be required for the refinery agreement. Most of the problems which arise when negotiating an exploration and production agreement with a government will arise in connexion with refinery agreements —local land laws, tax laws, customs duties, labour problems, and so on.

Transportation of Oil

By far the biggest problem here arises from the ownership and chartering of ocean-going vessels, although in other countries the problem of large-scale pipeline transportation is a subject on its own. In the marketing side of the business, there is the problem of road transport of all kinds with its own particular related difficulties.

Shipping law, coupled with marine insurance with which the lawyer must be familiar even though there are usually insurance experts who handle this type of work, is a specialized subject but one with which the oil lawyer must be generally familiar.

Ships have to be built, mortgaged, bought, sold, demise-chartered, and time or voyage-chartered. They are liable to collide with other ships, jetties, wharves, and obstructions of all kinds. Contracts with Masters and officers, Articles of Seamen, indentures for apprentices, contracts for radio equipment and other special equipment have to be looked at, not only once and for all time but also periodically.

International conventions are made in relation to shipping, covering all kinds of subjects from the use of radar at sea and oil pollution to the type of life jackets that must be carried and where to keep fire extinguishers.

The laws of more than one country may be changed; exceptions clauses as to the right to deliver cargo at alternative ports in the event of strikes may come before the courts and be interpreted in a manner which necessitates a rapid re-survey of charter-party conditions.

Debts are incurred for all kinds of supplies, including bunkers, to enable the ship to proceed. Ships which fail to pay for necessities may have to be arrested in ports far from England and under a mercantile system which may be largely unknown to the lawyer at his desk in London.

Disputes arise between owners and charterers on clauses in the charter party, and the charter party itself must be periodically reviewed to see that it is in line with the latest developments.

PART II

In Part I some slight indication is given as to the particular problems which may face the lawyer working for an oil company. There are also a host of other subjects which have to be dealt with which are not necessarily peculiar to oil companies but which would apply to any large company with international connexions.

These subjects range far and wide over the whole field of corporate activity. Treaties following the war, with their complicated compensation provisions, must be followed through with the greatest possible patience and persistence; activities of, and reports from, the various bodies set up under the auspices of the United Nations and of and from the United Nations itself; difficulties which arise from the relationships between countries may affect the legal relationships of subsidiary and associated companies operating therein; the corporate relationships between the various companies of any large group of companies (incorporated in more than one country), the co-ordination of their activities and the provision of advisory services of all kinds—all give rise to different legal problems.

Companies organized and existing in many different countries require advice and help on such complicated matters as retirement benefit schemes, housing facilities, and the engagement of non-national staff. Staff contracts, particularly for those required to serve with companies overseas, must constantly be kept under review, not only in respect of possible changes in the law of England but also of changes in the law of the country in which a man may be required to work.

Labour relations in the U.K. and other countries may again provide lawyers with yet a different field. Negotiations with trade unions and the subsequent drafting of agreements will be required and, when afterwards disputes arise, the conduct of industrial arbitrations will have to be considered.

In some countries where, for historical reasons, there may be several companies operating, it might be decided to simplify the corporate structure by amalga-

mating such companies into a single entity, and such a decision may involve a complicated exercise which involves the laws and procedures of perhaps four or five countries, particularly where the shareholding is not concentrated in the hands of one company. Governmental consents of all kinds may be required, and a close examination of exchange control and other laws may be necessary, to say nothing of a time table which must be constructed and operated so that all is done in the proper order.

Any unusual corporate activity will also need the lawyers' help (quite apart from the normal company and shareholders' meetings and the drafting of resolutions, minutes, changes in Articles of Association, etc.). For example, the raising of additional capital or the listing of the shares of an associated company on the Stock Exchange of a country abroad will require long hours of consultation with all the other departments concerned so that the proper advice may be given.

If large sums of money are to be borrowed, particularly by associated companies abroad, constant discussions and consultations with lawyers in the U.K. and in the country concerned will be necessary so that the final legal documents may be in the best possible form.

PART III

Parts I and II of this paper have sought to show—albeit in a somewhat sketchy fashion—the type of problems that are brought to a legal department in an oil company. However, it must be obvious from the wide range of subjects that all this work is not handled entirely by, say, a comparatively small department in an oil company resident in London. Not only is the co-operation and assistance of the legal departments of other associated companies in other countries necessary, but there is not a single subject which does not involve some other department in the same company.

It is the duty and responsibility of the legal department to safeguard the company's interests in all legal matters. It is their responsibility and theirs alone (with the company's outside legal advisers) to advise on and prepare the necessary documents in connexion with any matter which is intended to create legal rights and liabilities for the company.

This places a responsibility on the other parts of the organization to see that the legal department is kept generally informed on as many aspects as possible of the company's business. If this is done, then the lawyers build up background information and can, even perhaps without being specifically asked, make a comment which may save time and trouble later.

Another way in which the legal department is able to help arises from the fact that a number of departments in any organization continue over the years to deal with the same type of business and therefore to make the same type of contracts. While " standard forms of contract " can, in some ways, be dangerous, nevertheless, departments, if they will consult the lawyers, can have those lawyers draft a form of contract which, by and large, the department can feel is safe from a legal point of view for use in its day-to-day business. The only warning to be given on this is that the departments must have a periodic review of such forms.

This leads on to what is another duty of a legal department which, in any attempt to lay down the rights and duties of the department, is never actually expressed.

This is what one might call the duty to make other departments feel confident that, if they ask for advice, not only will they get it reasonably quickly but also when they get it, it will be reasonably intelligible and will show some appreciation of the business man's difficulties. It is not enough merely to know the law; the task of the lawyer employed in business is to apply the law to the business problems of his client with the least possible detriment to the business.

Any lawyer who adopts a purely legalistic attitude will, if he be in private practice, lose his clients and, if he be employed in a legal department of a large company, find that he is being ignored, since he is not rendering the service for which he is employed.

This matter of " confidence " which has to be created in the mind of the business man in relation to his lawyer raises the question of " salesmanship " by the lawyer himself. One has in recent years heard of the possible desirability of solicitors " advertising " themselves (as a body not as individuals) to the general public so that the public understands that, in the complications of everyday life, lawyers have an extremely useful service to perform.

In the same way, within a large company, it is necessary for the lawyer to create the same feeling in the minds of his " clients "—the other departments—that the legal department does help and obviously does its best to deal with all possible difficulties.

While on this subject of the " confidence " which the lawyer should endeavour to create, it is worth while looking at the other side of the picture, namely, that the lawyer must have confidence that his " client " is producing all the relevant facts. Too frequently, and this naturally applies to private practitioners as well as to legal departments in big companies, the " client " comes up with a statement of facts which is not complete, not that the " client " is intentionally concealing matters of importance but merely that he has left out of his statement matters which he considers irrelevant. Nine times out of ten one can say that the lawyer, in matters of this sort, is a far better judge of what is relevant and what is irrelevant and, in a company, it is far better to give the legal department every scrap of information, including, if need be, leaving with him a pile of papers and files for him to work his way through. This problem goes further when one is dealing with a legal department in a company in that it is the duty of the lawyer to use all means within his power to check the information that he is given by any department, including the independent checking on particular items with, possibly,

departments in the company other than that department which originally raised the subject.

The service that a legal department in any large and highly complicated organization can perform is unique and one which is difficult to over-estimate. Dealing as it does with the day-to-day business of the company and living inside that company, it acquires knowledge of the company's affairs which over a period is invaluable in the proper consideration of any particular case. It thus acquires an ability to advise on the handling of the company's affairs so that its legal difficulties may be reduced to a minimum. It is simply not possible for anyone outside the organization to obtain a complete picture of all the different aspects of any situation, since this necessitates an intimate knowledge of the business together with the experience of the past and the ability to obtain the true facts. If the internal lawyers are used and employed to the fullest extent, the company will find that service rendered by them is something which it cannot obtain by any other means. At the same time, no large organization can properly dispense with the services of lawyers engaged in general practice. The employed lawyers provide an invaluable link between the departments of the organization and the outside practitioners where litigation arises, some matter of fundamental importance is involved, or the experience and skill of the general practitioner is required.

As far as the internal organization of the department is concerned, it is desirable to have men specialized in particular subjects, but it is necessary also for them to have experience in other fields, since the department must be as flexible as possible so that the work may be carried on without interruption. There is, therefore, the need for great co-operation between the members so that no lack of continuity arises as a result of absences owing to illness or, as is quite likely, absences owing to the necessity of sending a man overseas if it becomes necessary to discuss any particular problem with the manager and lawyers of an associated company abroad. This co-operation requires, among other things, a constant interchange of information between the lawyers themselves, and it is not satisfactory to have one lawyer permanently assigned to a particular department in a large organization, much less to work there away from the other lawyers, as otherwise, he will rapidly get out of touch with general legal developments and, in time, tend to be less useful to that department from a legal point of view than he once was, with the result that that department will no longer be getting the service to which it is entitled.

As indicated at the beginning of this paper, only a broad survey of a legal department's work is practicable, but perhaps, even so, it may have been possible to indicate the wide variety of work which goes on in a legal department in an international oil group. At least one lawyer considers it a most lively and interesting place in which to work.

DISCUSSION

V. Bixke: I am sure that the large canvas, to use Mr O'Brien's own term, which he has put before us has surprised many of us by the extent and variety of the work which his department has to handle. My own reaction is that dealing with all the facets of the oil industry which he has mentioned in respect of one country alone would be a quite sufficiently complex task, but which would, of course, be expected from a legal department. To cope with such matters on a world-wide scale certainly seems to present some awesome problems, and I would welcome from Mr O'Brien some details of how such a task is tackled. Quite apart from the complexity of dealing with the legislation of a very large number of separate jurisdictions, the language problems involved must in themselves prove a major obstacle.

Could the lecturer tell us to what extent the perusal and summarizing of legal legislation is carried out on the spot by lawyers brought up in the particular legal system and language concerned and at what point in a transaction is the matter referred to his department in London? One would imagine that in the case of a contract to be fulfilled entirely within a foreign jurisdiction, such as, for instance, a conveyance of land, it would almost certainly be necessary (and might in certain cases be compulsory) for such a contract to be drafted by a lawyer practising within the jurisdiction and not in a central office in London.

I would also be most interested to have particulars of the legal library which Mr O'Brien's department possesses. It would appear to be impossible that such a library could be self-contained, at least in respect of foreign law. Are the necessary points checked by reference back to the country concerned; in which case, where is the necessary translation done if the original law is in one of the less well-known languages? Is much use made of the various legal libraries of London, such as that of the University of London's Institute of Advanced Legal Studies?

I note that the lecturer disapproves of lawyers who adopt what he calls a "legalistic attitude." I do not know whether I have misunderstood this phrase, but it seems to me that to adopt a legalistic attitude is exactly what the lawyer is for. As I see it, one of the duties of the lawyer is to advise his client upon what he, the lawyer, considers would be the interpretation of a particular set of circumstances by a court of law. Much has been written, especially in recent years, of the undesirability of the courts themselves adopting an unduly legalistic interpretation. One of the leading proponents of such an attitude has been Lord Justice Denning, and he has recently stated, "Some lawyers care too much for law and too little for justice. They have become technicians spelling out the meaning of words. . . ."* However, and with due respect to the learned Lord Justice, it is the technical meaning of words which more often than not prevails in the courts and which the lawyer, advising his client, should bear in mind, however "legalistic" this may appear. A recent example of such attitude may be seen in a case † in which it was sought to make a workman personally liable for an injury to another workman, and in respect of which his master had had to pay compensation.

In delivering one of the majority judgments Romer, L.J., adopted and applied an observation from an earlier case in the following terms: "Justice, as we conceive justice in these courts, says that the person who caused

* Denning, A. "The Road to Justice," p. 6. London: 1955.

† Romford Ice & Cold Storage Co. Ltd. *v.* Lister (1953) 3WLR 631.

the damage is the person who must in law be called upon to pay damages arising therefrom." *

In his dissenting judgment Denning, L.J., referring to the claim of the employer said, "Nothing could be more detrimental to good relations between an employer and his servants; nothing could be further from the contemplation of the parties." †

Here I think we can fairly say there is a measure of conflict between the legalistic and the broader attitude, although it must be made clear that the dissenting judgment in the case just quoted was not based solely on such a broader view, but also on an interpretation of the purely legal, as distinct from what may be considered the sociological, aspects of the case, which interpretation was, however, not adopted by the majority of the court.

Perhaps I may quote an example of what may be termed a "narrow" interpretation of the law. In a Scottish case ‡ it was held that "any vehicle" in s. 22 of the Road Traffic Act, 1930, includes the driver's own vehicle, and that hence, when a collision occurred with a wall (which does not appear from the evidence to have been damaged, although the vehicle was), it is an offence, in the absence of communicating the driver's name and address to anyone concerned, not to report such an accident to the police. This decision (following an earlier English decision in the same sense) could hardly be a more legalistic interpretation of a statute.

I am a little surprised that in discussing the functions of a legal department Mr O'Brien has said nothing about patents. I appreciate that patent specifications are normally drawn up by consultation between the technical staff concerned and the company's agents. Circumstances must, however, surely occur when a more complex matter arises, such as the drafting of a patent licensing agreement or the question whether an infringement has occurred, either of a patent owned by the company or else of someone else's patent by the operation of a process by the company. Although, in many cases, the opinion of an experienced patent agent is of the greatest value, I would have thought that lawyers would also have been involved, particularly in the case of licensing agreements, and the allied subject of agreements for the provision of technical "know-how," a most useful discussion of which latter appeared a few years ago in one of the legal periodicals.‖

F. U. J. O'Brien: In regard to the language problems involved in dealing with matters on a world-wide scale, and the perusal and summarizing of local legislation on the spot by lawyers brought up in the particular legal system concerned, I mentioned that one of The Shell Petroleum Company's functions is a co-ordinative one for the other associated companies in the Royal Dutch/Shell Group. The companies operating abroad under different legal systems and different languages operate independently; they have their own legal advisers, either internal or external, depending on the size and circumstances of their operations. Local contracts are, quite rightly, the perquisite of that company and its own legal advisers. It is not necessary for an associated company to refer an ordinary contract in a foreign country to The Shell Petroleum Company in London. We, in London, are, however, always delighted to advise on any unusual contract which has semi-international connexions in another country. Language and local customs are not quite so much of a problem as one might imagine. If the problem is one on which the local company considers it would like the advice of its advising company in London, it will translate any relevant document or it will send them to London for translation. It may be that we then decide, in London, either that we can deal with it quite simply in a letter, or we will send one of our lawyers out to see whether he can help.

Some of our lawyers speak other languages; some of them are, in fact, of nationalities other than English. And that is one of the ways in which The Shell Petroleum Company deals with this world-wide problem—by travelling. When we do this travelling we do not tell them what to do; we say, "We have knowledge of something similar in country 'A.' This is what happened in country 'A.' And we also know of country 'B,' where it was slightly different." It is always a question of going out to advise, and help, the company operating abroad. They have their own local law, their own local conditions. It would be presumptuous of us to tell them how to do things; we can help them in lots of ways, because over the years we have built up an experience in some particular type of work, but it is always on an advisory basis.

When we get out there maybe the language problem becomes a little difficult, but, by and large, we find that a large percentage of the world manages to understand English, and we lawyers manage to learn a few words of the foreign language.

We travel a lot—that is one of the fascinating things about working in The Shell Petroleum Company's legal department. At least, it is fascinating to do the travelling; being left behind when everyone else is travelling is not quite so fascinating.

As far as the legal library is concerned, there is, in St. Helen's Court, quite a large one. It contains all the English law reports, and quite a considerable number of text books, and we are building up, over the years, copies of or commentaries on, foreign laws of the various countries in which associated companies are operating. This takes time, and one of the chief difficulties is keeping abreast of foreign laws—it is difficult enough to keep abreast of English law. We may get a copy of the laws of Timbuctoo, dated 1953; it is a very dangerous thing in 1960 to use that law, because by then it will probably have been changed.

We also make use of the various legal libraries in London.

Obviously I made a great mistake in talking about a legalistic attitude, because Mr Biske has taken me up on this matter in rather a strong way, including those quotations that some lawyers care too much for law and too little for justice. What I was really driving at was the necessity not to use too many technical legal expressions in trying to explain to other departments of the organization why they cannot do what they want to do. Sometimes one is able to tell departments that they can do what they want, and one is always rather glad that one can do that. But it is true that one has to be legalistic in the sense that Mr Biske has used the term.

It is also true that it is necessary for there to be considerable co-operation between the lawyers and the technical people, or the technological departments in the oil company. But I do not know if it matters too much whether the lawyer really understands how the refinery works. I talked earlier about the lawyer having his feet in two camps: one foot in the commercial world and the other in the legal world. There is a limit as to how much one man can learn and still retain his own sanity, and I am not sure that one really wants, and whether one's own and one's other departments would like it if one really started to argue as to how the refinery works, or whether a piece of equipment is the right kind of equipment. One needs to know broadly what goes on. I have often seen in contracts, references to 100 seconds Redwood 1. It is only about three weeks ago that I discovered the meaning of this phrase, and I now understand

* Denning, A. "The Road to Justice," p. 659. London: 1955.

† *Ibid.*, p. 641.

‡ Tucker *v.* Mackenzie 1955 S.L.T. 367.

‖ Blanco White, T. A. *Conveyancer*, 1951, **15**, 89–95, 509–17.

that a Redwood viscometer is some kind of a cup with a hole in the bottom. I have gone on for a long time without knowing this, but I do not think it really mattered.

Mr Biske has also said—he was a little surprised—that I have said nothing about patents. The reason why I did not say anything about them is that as the legal department is at present organized, it does not deal with any patents. There is, as some of you may know, a patent department, and it used to be rather more closely connected with the legal department than at present. But there is still close co-operation between the two departments. We have in the legal department a weekly meeting, which is usually attended by the head of the patent department.

In regard to the question of licensing agreements, there again, the legal department is not concerned with those kind of things, but it is a little closer to the people who do deal with them than it used to be.

S. Eker: Will Mr O'Brien please give us an idea of the size and composition of his own legal department?

F. U. J. O'Brien: The legal department of The Shell Petroleum Co. in London consists of approximately fourteen lawyers. We have, first of all, the manager of the department, Mr G. W. Haight, who is an American. Then, three senior lawyers, Sir Valentine Holmes, Q.C., Mr Geoffrey Tribe, and Dr Bruell. Sir Valentine Holmes was a well-known leader of the Bar, who retired some years ago from the Bar. The same applies to Mr Tribe, who was a tax lawyer; he also retired from the Bar some years ago. Dr Bruell was a Viennese lawyer, and just before the second world war was one of the leaders of the Viennese Bar.

Then there are four solicitors, of whom I am one, four or five barristers, and a Dutch lawyer who came over to work with us from our associated company in The Hague.

One of the difficulties is to decide what is the right number of lawyers to deal with the problems that come in to the department—especially as there are usually some members abroad, who advise and discuss with people on the spot.

I do not know whether fourteen is the ideal number—sometimes I do not think it is enough.

J. Tyson: I do not know whether this is a fair question—because it deals primarily with patent licensing agreements. As a result of the method of development of the petroleum industry, many of these originated in the U.S.A., and it is fairly common for these agreements to contain a clause which says that irrespective of the country in which they apply they shall be construed under the laws, for example, of the State of New York. I would value the lecturer's opinion as to whether this is, or is not, a good thing.

F. U. J. O'Brien: As far as I know, the law of the State of New York is extremely good but, in any event, if, as you say, most of the patents come from the U.S.A., it is not unnatural that the owners of those patents would want agreements which they make in respect of them governed by the law in the State of New York, which is very likely the State in which they are resident. We, at this end, naturally like to have our agreements governed by the law of England, mainly because we think we know what the law of England is, but, on the other side of the Atlantic, there is no reason why such agreements should not be governed by the law of New York. Moreover, American law and the law of England bear many similarities.

J. M. Soesan: I think it was Henry Ford who said that the greatest business risk is the legal risk. I would like to use that as an introduction to my question, because I would like to have Mr O'Brien's views on how he can put over to the business side of the oil industry the quantum of risk in any particular case. Law is not like many other branches that are dealt with in the oil industry. If I go to a chemist and ask him the gravity of a motor gasoline, he can give it to me, to three or four decimal places; but if I go to a lawyer with a contract, say, and ask him for the interpretation of a particular clause, and tell him that we say that it means one thing and the XYZ Oil Company says that it means something else, and I ask him which is correct, nine times out of ten, he cannot give me a positive answer. He cannot say, "This is correct," "You are correct," or "The XYZ Oil Company is correct." He has to hedge, and I think this arises from the fact, as a great American jurisprudent once said, "The law is what the courts decide in a particular case."

My question amounts to this: Has Mr O'Brien any method or formula for putting down on paper the quantum of risk in a particular case? Does he, for example, express the risk as a percentage, by saying, "You have a 50 per cent chance of success"?

F. U. J. O'Brien: No, there is no strict formula for the chances of success. One is often asked, "Supposing we had to go to law on this, what are our chances?" Well, we might say, "You stand a very good chance" or "Your chances are less than 50 per cent." We seldom say that "You stand 100 per cent chance," for the simple reason that you never come and ask us those kind of questions which are 100 per cent clear. You come and ask us only questions which you have probably been unable to work out for yourself. One can, perhaps, on some occasions, indicate the measure of the damages if you are wrong, and how much it is likely to cost you, but on the interpretations of clauses one has to use the precedents and the cases, which are never quite on "all-fours" with the clauses which you want us to interpret, and give an answer to the best of our judgment. But a formula for a quantum of success comes from experience and in knowing the sort of trends, the ideas, and what has been said in the past.

J. Romney: Are the rewards for being in the legal department of an oil company comparable with those of private practice in the outside fields?

F. U. J. O'Brien: What do you mean by rewards? If you mean sheer financial reward, would it not be true to say that any man working in a small business is probably getting less by way of financial rewards than a man working with a large organization, with their pension funds and other facilities?

There is another angle to this though, that the independent man has the feeling of achievement, of building up his own business, whether it be a legal business or any other kind of business. There are not, as far as I know, any figures which would show what a solicitor in private practice or a barrister in Chambers is earning, and therefore it is impossible to compare such earnings with the salaries paid in the legal department of The Shell Petroleum Co. If one works for the legal department of an organization such as mine, there are opportunities for travel which probably come more frequently than to the solicitor in private practice and, indeed, the barrister in Chambers. I have drawn a happy picture of the lawyers in The Shell Petroleum Co., and I believe it is a true one.

G. R. Guest: I would like to ask Mr O'Brien whether the services of his legal department are available to the staff of The Shell Petroleum Co.

F. U. J. O'Brien: The answer to that is "No," we are not organized to deal with the personal problems of the staff. I do not know what sort of staff we would need in the legal department to deal with the personal problems of all the staff of The Shell Petroleum Co., and all its associated companies in London (I believe it is something

like 5000 people). However, it is perfectly obvious that if I am dealing with a particular man in a particular department, it may happen that the time will come when he will say to me that he, or someone in his department, is in a little trouble, and will I see him? One does so, on a friendly basis, but there is virtually a standard reply which is made by all the members of our legal department on this sort of subject. We are prepared to listen to a short story, not a long one, and the standard answer is usually, "My dear sir, you have not got much of a story" or "You have not got a case," or, "You should consult your own solicitors." Naturally, if there is a crisis and a member of the staff is in a terrible state, or if he is just going abroad, we will do our best to help him, but we do not normally deal with staff problems. We are not organized or equipped to deal with them, and if I may just add a personal thought here—I am not so sure that it is a very good idea to get the company's official legal department mixed up too much with the personal problems of the members of the staff. I do not think that I personally want to know their personal problems, especially if I shall be dealing with them in business the next day. I know that it does not really make any difference, because one can put their personal problems on one side, but even so I do not think it is very desirable.

F. A. Turton: I would like to refer to Mr O'Brien's reference to the freedom of action which The Shell Petroleum Co.'s foreign companies enjoy in their legal activities. Is there not some form of control exercised from London on foreign companies concluding matters requiring legal advice, without prior reference to London, or without first "calling for help," to use Mr O'Brien's words? Are not foreign associated companies required to tell The Shell Petroleum Co. in London what they contemplate by way of concluding an agreement, and would not The Shell Petroleum Co. in London think it necessary to inform the foreign associates whether they find the particular proposals to their liking?

F. U. J. O'Brien: We do not have any control over the lawyers employed by companies operating abroad. We do not in 99 per cent of the cases even have any direct correspondence between the lawyer in London, such as myself, and what one might call my opposite number abroad. The company operating abroad runs independently. It is up to the Board of Directors, or the general manager in that country abroad to decide, in consultation with their own lawyers, whether they need further advice from the co-ordinating company in London. This is true not merely on the legal side but also on the other side of the business as well, both the man and the company abroad look after themselves. We, as one of the staff of service departments of The Shell Petroleum Co. in London, are available if they want us.

I agree that if they make an awful mess of something we may indicate that perhaps if we had been asked we might have been able to help before the mess occurred.

A. W. Deller: The only experience I have had of using the facilities of the legal department involved a rather crooked (Indian) artist and some even more crooked (Indian) lawyers, and I recollect that we took some advice from the legal department, but then, when the action came to the courts, we were represented by somebody outside. I am not sure of the standard procedure with that, but am I right in assuming that when it comes to a court action, or anything like that, that you bring in outsiders. If so, is that a matter of common practice or rather of professional etiquette?

F. U. J. O'Brien: A matter of common practice, as far as we are concerned in London, but we do not undertake, within the legal department, the conduct of litigation ourselves. As far as litigation is concerned, The Shell Petroleum Co. does not really get into much litigation. This may be due to the quality of the legal advice it gets beforehand, it may not be, but if it does, then the matter is put into the hands of outside solicitors. There is a practical sense in this, because if one is going to do something which has certain technicalities of procedure, a knowledge of how to run an action, we use the expert outside lawyers to run it for us. We do not try to do it ourselves. We could, I suppose, set up a litigation department, but I am not sure that it would be entirely satisfactory, and I have a feeling that if we did employ lawyers to do litigation they would get awfully bored waiting for the litigation to come. So it is much more satisfactory even from that point of view to use outside solicitors.

S. Eker: I believe I am correct in saying that a practising barrister is one who is entitled to practise, and who holds himself ready to do so, not being otherwise employed in a wholetime occupation.* It has been ruled by the General Council of the Bar that "a practising member of the bar should not at the same time be legal adviser to a company at a salary."† It would therefore be inconsistent with the rules laid down by the Council of the Bar to allow a firm's legal department to undertake the pleadings in litigation of an action.

I also believe that the Law Society is not in favour of allowing staff in legal departments to deal with the problems of the employees themselves, as against problems that arise in connexion with the firm's business, as this would tend to take away much from the livelihood of the solicitor in practice on his own account.‡

F. U. J. O'Brien: First, you say that members of a legal department cannot appear for litigation for the purposes of conducting an action. I think you are probably referring to Counsel and barristers, who appear in the High Court. That is perfectly true. The barristers we employ are no longer considered to be practising at the Bar, and would not, in the interest of the Bar, be allowed to appear in court on behalf of the company. Secondly, in answering the preceding question, I was not thinking so much of the Bar but more of the solicitors' side, *i.e.* of the instructions to Counsel and the running of the litigation. It would be necessary to instruct Counsel to appear in court, and I should have made that clear.

As far as dealing with staff problems is concerned, I think I have made our own position clear, but it is nevertheless a very difficult situation.

D. L. Samuel: Mr O'Brien has been asked before a question with regard to language difficulties in a company which has international ramifications, and he spoke about dealing with lawyers in Turkey, Persia, Japan, and Pakistan. I am rather surprised that language difficulties are not considerable, because it is a common experience that a document drawn up in English by an English lawyer may be interpreted quite differently even by two other English lawyers. I should therefore have thought that trying to get a legal opinion from a lawyer, for example, in Japan, and to understand exactly what he was driving at, would be an almost insuperable difficulty.

I would like to ask two questions. The first deals with the opening remarks, in which the author spoke about the lawyer within the company being in a rather better position in some respects than a lawyer outside, in that he knows through working with the company what is going on. I would like to know exactly how a legal department is kept informed of what is happening in the company. Do the companies give prior notification that they are

* Halsbury's "Laws of England," 3rd Ed., Vol. 3, p. 59, para. 89. Rule of the General Council of the Bar, 1950.

† Annual Statement of the General Council of the Bar, 1935, p. 8.
Annual Statement of the General Council of the Bar, 1938, p. 9.

‡ *Law Society's Gazette*, July 1953.

going to negotiate a deal on which they may want some legal advice, or do they enter into the negotiations, and then if a problem comes along, refer it to the legal department, giving the necessary background?

The second is whether there is any close contact between the legal departments of the large oil companies or other large organizations, with a view to discussing similar problems that may arise.

F. U. J. O'Brien: In regard to your first question as to how a legal department is kept informed of what is happening in the company, I am afraid a department quite frequently comes along to us and says, "Look, we have just made this deal. Now will you kindly write it up in legal form." Thus, there arises quite a large problem that we consider needs straightening out. We take the view that you cannot bring the lawyers into the deal too early; not necessarily around the conference table, but at least as soon as possible when there is an idea that a deal of some kind is going to be made. Tell the lawyers about it. They may be able to say, "If you will work in this direction, rather than in that direction, it will make it so much easier in the long run." Of course, the lawyers may be wrong, and make it even more difficult for you. But that is the problem: how soon are the lawyers to be brought in? We never consider that we are brought in soon enough, and there have been occasions when we could prove it. It is not very satisfactory from our point of view if we have come in a little too late; on the other hand, we appreciate that there are occasions when the business man does not want the lawyer about before he has started to negotiate. It is a problem that has to be worked out in practice.

On the other hand, if there are deals going on, it is very helpful if the legal department can see the correspondence or the cables or whatever it is, so that when they are asked to come in, they have got some idea of what the basic problem is and what one is trying to do.

As far as close contact with lawyers of other oil companies is concerned, there is a reasonable contact. Where one gets a deal which involves more than one oil company, then one comes into very close contact with the lawyers of other companies. If one gets something which involves companies of different nationalities in a single deal, then also one gets close contact. I think that a closer co-operation between the lawyers, a closer contact than we have at present, is desirable. The chief difficulty is that all legal departments receive confidential information. It is so easy to say something which one should not say to another oil company.

P. M. de Veulle: Mr O'Brien has shown us the great number of the complexities which enter into a large organization, many of them legal. In the U.S.A., the lawyer is a very great influence in business organization. As far as the U.K. is concerned, I would like to ask Mr O'Brien how far he considers an executive should have some degree of legal training so as to enable him adequately to deal with day-to-day business matters?

F. U. J. O'Brien: In my company there are a number of executives who have received legal training but who are not part of the legal department. It is sometimes a help if the executive with whom one is dealing has had some legal training in the past, because he can perhaps talk the same language as oneself. It is, on the other hand, not always so satisfactory because he remembers some of the law which he learned twenty years ago, and which may have changed since then, so that one has to persuade him that it has changed, as well as telling him what it is. Speaking purely personally, without any disrespect, I think I prefer dealing with someone who is not a lawyer—but I do not know whether that would always hold good.

J. K. Anthony: In my earlier days, when articled, fortunately not in the legal profession, I moved about a little, and in a number of fields of industry one came across solicitors working for certain concerns, particularly in the building industry, dealing with conveyances, mortgages, tenancies, and so forth, and there I met the term "tame solicitor" quite frequently. Somehow, I do not think that the members of the legal department of the oil company mentioned this evening can be described as "tame solicitors."

I would be rather interested to know how far the legal department of which our speaker has had experience deals with tax matters. It is a very wide field now, particularly in international industry, with international connexions, and I rather feel it is one of those problems which is the province, mainly, of the acknowledged experts on the subject, the company's auditors and perhaps their "tame" accountants.

F. U. J. O'Brien: There is tax law and there is tax practice. The practice in which accountants and tax experts of that kind are experienced, is something which is necessary in any large organization—especially at the present time. But there is also the question of the tax law on problems which have arisen, maybe on new problems. We, in the legal department of The Shell Petroleum Co., have a tax lawyer. There is also in the Company a Taxation Department which forms part of the Financial Administration. The relations between the tax lawyer in the legal department and the Taxation Department in Finance Administration are excellent. It is chiefly a matter of personalities here, and the lawyer comes into it to a great extent. Both practice and experience in what is actually done in fact, although valuable, is actually incomplete, without a consideration of tax law as well. I would not accept that it is entirely the perquisite of the Finance Department and the accountants.

F. A. Turton: There is just one feature about the activities of a legal department in a large organization that seems to me to conflict with an important function of the business man, which is to take risks from time to time. Perhaps the most successful chairmen, directors, and managers are those who know when to take risks. The lawyer does not take risks. Who has the last word in The Shell Petroleum Co.?

F. U. J. O'Brien: The directors, obviously. I could not say otherwise, but the lawyers' function is to say what the risk is on the legal side. I do not mean the difference between doing something legal and something illegal; we do not have to advise that way; but an assessment of the risk, as to what kind of trouble or damages one might get into. Thus, the lawyer insists on having a certain type of clause in the agreement in order to provide for special contingencies in years to come. The lawyers are, in fact, a staff or a service to a company. They can say, "We think this agreement is a bad one and we do not recommend it be signed," but we cannot, unless we are in a position to say that the thing is illegal, say to the directors, "You are not to sign this agreement." We will say it if it is illegal, there would be no hesitation about that, but the risks which are involved, merely whether you put this clause in, or cover that, or whether this language is good enough or not, it must be up to the directors of the company, and not to us—we can only advise them, albeit very strongly at times.

A. C. Hartley: The discussion has shown the very keen interest which this paper has created, and I am sure you now wish me formally to thank Mr O'Brien for the trouble he has taken in preparing the paper, the way he has delivered it, and for answering all your questions.

The vote of thanks was accorded with acclamation.

ACID TREATMENT OF SHALE GASOLINE

PART III. EFFECTS OF SOME TREATMENT CONDITIONS *

By GEO. E. MAPSTONE † and J. A. GROSBERG †

SUMMARY

Increasing the treatment temperature to about 100°–120° F gave a more stable gasoline. Treatment at 100° F with 70–72 per cent acid gave results comparable with those obtained using 93 per cent acid at ambient temperatures, and has been confirmed on the plant scale.

If the tar acid content of the raw gasoline is above about 0·2 per cent their extraction by the acid can cause dilution and consequently reduced treatment efficiency.

INTRODUCTION

THE treatment of gasoline with sulphuric acid is normally applied for one or both of two quite different purposes, the removal of unstable gum-forming constituents and the extraction of sulphur compounds. The removal of gum-forming compounds, such as pyrroles and olefins, is effected partly by their extraction, but mainly by polymerization. On the other hand, sulphur compounds are generally removed by solvent extraction, although the alkylation of thiophenes has been shown to play an important role in the desulphurization of shale gasoline by acid treatment.[1]

These three reactions of polymerization, alkylation, and solvent extraction are naturally affected in different ways by changes in conditions, such as temperature and acid concentration. Thus, polymerization and alkylation increase with temperature and acid concentration, while solvent extraction decreases with increasing temperature and increases rapidly with increasing acid concentration. Since solvent extraction plays only a minor role in the treatment of shale gasoline [1] and, in the present instance, sulphur removal was only secondary, the effect of temperature and acid concentration on the stability of the gasoline was investigated.

Since it has been observed [2] that tar acids are readily extracted unchanged from gasolines by sulphuric acid, the quantitative effect of this extraction with 70 per cent acid was determined.

The treated and re-run gasoline normally has a very pale yellow colour. The yellow colour of some cracked gasolines has been suggested as being due to the presence of fulvenes.[3] Since small amounts of *cyclo*-pentadiene could be detected in the untreated gasoline by the Afanas'ev Test,[4] it was felt that the colour in the treated gasoline may be due to its condensation with traces of aldehydes and ketones present. The effect on the final colour of adding an aldehyde or ketone to the gasoline before treatment was therefore examined.

Once the practicability of the use of the cheaper and more readily available 70 per cent acid had been established by the laboratory work, the weaker acid was tried on the plant scale. Up to the present over 2,750,000 gal of gasoline have been treated with 70–72 per cent acid at 100° F and have given a product of stability at least equal to that obtained when using 93 per cent acid at ambient temperatures.

EXPERIMENTAL

Methods

One and a half litres of the gasoline, which had previously been washed with dilute caustic soda to remove phenols and with dilute sulphuric acid to remove tar bases, were placed in a tared mixing flask. The flask was fitted with a sealed mechanical stirrer and a bottom drain cock and, where necessary, was immersed in a constant temperature bath. The flask was weighed, and about 4 cc of mercury were run into the bottom of the flask, to fill the drain line and to ensure complete mixing of the small volume of acid. The 0·5 per cent v/v, *i.e.* 7·5 cc, of 93 per cent acid was pipetted into the pressure distillate (P.D.) The mixture was stirred vigorously for 30 minutes and allowed to settle for 30 minutes.

It was essential that all the acid tar was run off because the acid tar was only slightly soluble in water and so would otherwise remain in the P.D. even after water washing. If an appreciable amount of acid tar was left in the petrol, the colour and the gums after distillation were poor.

Two water washes of 1 per cent, *i.e.* 15 cc, and 10 per cent, *i.e.* 150 cc, respectively, and one neutralizing wash with 15 cc of 10 per cent caustic soda were given. The flask was then re-weighed.

The 1 per cent water wash had to be vigorously stirred so as to carry down all the acid tar adhering to the sides of the mixing vessel, as the 10 per cent water wash would not wash this acid tar out afterwards.

The total volume of gasoline after treatment was transferred to the Steadman apparatus, and an atmospheric distillation was carried out at a temperature of 300° F in the still-pot. The distillation was then completed under vacuum. The commencing vacuum was 40 mm Hg, and this was gradually reduced to 20 mm Hg as approx 100 cc of gasoline remained in the still-pot. The rate of distillation was 4–6 drops per second. The bottoms were transferred

* MS received 23 January 1956.

† South African Mining and Refining Co. Ltd.

to a micro-fractionation apparatus, and the distillation continued until 25 cc of residue remained. This distillation was done at a pressure of 5–10 mm vacuum and with a reflux ratio of about 2 : 1. An Engler-type distillation was carried out on the distillation residue.

When required the colour of the gasoline was determined by the Lovibond colorimeter (IP 17/52). Gum contents were determined by ASTM D381–50. The storage stability of the gasoline was determined by heating under 100 p.s.i.g. oxygen pressure to 100° C for 4 hr,[5] followed by the determination of gum and colour.

Laboratory Work Done

The first series of treatments was carried out with different amounts of 93 per cent (w/w) sulphuric acid at different temperatures. The results are given in Table I and Fig 1.

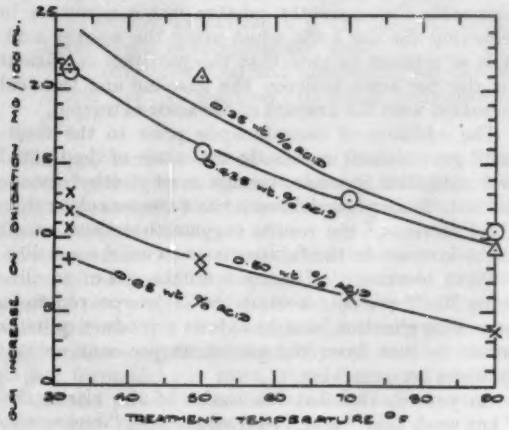

FIG 1

EFFECT OF TEMPERATURE ON TREATMENT WITH 93 PER CENT ACID

TABLE I

Lovibond Colour Increase after Oxidation
(Using 93% H_2SO_4) *

Acid used v/v (%)	20° F	32° F	50° F	70° F	90° F
0·35	—	82	70	—	6·6
0·425	—	64	6·0	2·4	7·2
0·50	6·7	1·5	1·1	1·4	0·8
0·65	—	2·4	—	—	—

* Colour Increase = $(R + Y)$ from 6-inch cell after oxidation.
$-\frac{1}{2}(R + Y)$ from 18-inch cell before oxidation.

The second series of treatments was carried out at 80°–85° F, using acid concentrations ranging from 60 per cent to 98 per cent w/w. The amount of anhydrous acid used was constant and equivalent to 0·50 per cent by volume of 93 per cent acid. The results are given in Table II.

TABLE II

Effect of Acid Concentration

Acid concentration, % w/w (*a*)	60	70	80	98	93
Treatment loss, wt % (*b*)	0·87	0·87	1·22	2·26	2·26
Polymer, vol % (*c*)	1·42	1·56	1·08	1·477	1·67
Total loss, vol % (*d*)	2·29	2·43	2·30	3·73	3·93
Gasoline sp. gr. after treatment (*e*)	—	0·760	—	0·759	0·759
Gum increase on oxidation, mg/100 ml	16	9	9	5	8
Sulphur in gasoline, % by wt	n.d.	n.d.	0·36	n.d.	0·34
Sp. gr. of bottoms	0·873	0·910	—	0·943	0·940

Treatment at room temperature

(*a*) The amount of acid was kept constant and equivalent to 0·50 per cent by volume of 93 per cent sulphuric acid.
(*b*) Dissolved by acid sludge.
(*c*) Bottoms distilling above 420° F, the F.B.P. of the raw gasoline.
(*d*) Assuming treatment loss % by wt = % by vol.
(*e*) Sp. gr. at 60° F before treatment 0·757.

The effect of temperature on the results of treatment with 0·65 per cent by volume of 70 per cent acid (equivalent to 0·50 per cent of 93 per cent acid) was then determined. The results are given in Table III.

TABLE III

Effect of Temperature on Treatment with 70% Sulphuric Acid (a)

	65° F	85° F	100° F	120° F
Sp. gr. gasoline at 60° F (*b*)	—	0·760	—	0·759
Sp. gr. of bottoms	0·897	0·910	0·895	0·925
Gum increase on oxidation mg/100 ml	15·4	9·6	8·1	7·8
Treatment loss, wt %	0·87	0·87	1·30	1·56
Polymer loss, vol % (*c*)	1·60	1·56	1·51	1·52
Total loss, vol % (*d*)	2·47	2·43	2·81	3·08

(*a*) 0·63 vol % of 70% w/w acid used, equivalent to 0·50 vol % 93% acid.
(*b*) Sp. gr. before treatment 0·757 at 60° F.
(*c*) Bottoms distilling above 420° F, the F.B.P. of the raw gasoline.
(*d*) Assuming treatment loss % by wt = % by vol.

Removing the tar bases with 30 per cent sulphuric acid at 100° F instead of 60° F prior to the treatment with 70 per cent acid at 100° F had no significant effect on the results. The effect of the amount of 70 per cent acid is given in Table IV.

TABLE IV

Effect of Amount of 70% Acid Used
(Treatment Temperature 100° F)

Acid used, % by vol	0·40	0·49	0·55	0·63	0·71	1·28
Gasoline sp. gr. after treat (*a*)	0·762	0·763	0·762	—	0·763	0·762
Sp. gr. bottoms at 60° F	0·903	0·911	0·916	0·895	0·920	0·926
Polymer loss, vol % (*b*)	1·50	1·50	1·50	1·51	1·50	1·49
Treatment loss, wt %	1·03	1 30	1 14	1·30	1·75	1·75
Total loss, vol % (*c*)	2·55	2·80	2·64	2·81	3·25	3·24
Gum increase on oxidation, mg/100 ml	19·1	18·3	5·7	7·1	6·3	9·1
Sulphur content, wt %	0·31	0·37	0·37	0·37	0·37	0·36

(*a*) Sp. gr. at 60° F before treatment 0·757.
(*b*) Bottoms distilling above 420° F, the F.B.P. of the raw gasoline.
(*c*) Assuming treatment loss wt % = vol %.

For the determination of the effect of the tar acid content of the gasoline measured volumes of redistilled tar acids were added to tar acid and tar base-free gasoline, which was then treated with 0·7 per cent of 74 per cent sulphuric acid at room temperature (75°–80° F). Under these conditions there was less

polymer and sludge formation to interfere with the solvent extraction effect than if the treatment had been carried out at a higher temperature. The acid sludge was separated and, in some cases, weighed. The treated gasoline was washed with 0·1 per cent and then with 10 per cent by volume of water and the tar acid content again determined. The results are given in Table V.

TABLE V

Extraction of Tar Acids by Sulphuric Acid

Sample no.	1	2	3	4	5	6
Tar acids added, vol %	0·1	0·2	0·3	0·4	0·6	1·0
Tar acids added, gm	1·5	3·0	4·5	6·0	9·0	15·0
Tar acids recovered, gm	1·5	3·0	3·5	4·5	6·0	7·5
Treated acids in treated gasoline	0·133	0·266	0·312	0·401	0·534	0·667
Tar acids extracted, gm calc	0	0	1·0	1·5	3·0	7·5
Increase in weight of acid	n.d.	n.d.	n.d.	n.d.	3·0	8·0
Concentration of H_2SO_4 after extraction, %	74	74	70	69·5	60	51
Partition coefficient for extraction	0	0	38	42	56	85

For the determination of the effect of benzaldehyde and methyl ethyl ketone on the colour after treatment 5 cc were added to 1500 cc of the raw gasoline, which, after caustic and acid washing to remove tar acids and tar bases, was treated with 0·75 per cent of 70 per cent sulphuric acid at approx 60° F, after which it was redistilled. The results obtained are given in Table VI.

TABLE VI

Possible Fulvene Formation During Treatment

Additive	Lovibond colour (6-inch cell)	
	Red	Yellow
Nil	0·3	3·0
Benzaldehyde	0·5	4·3
Methyl ethyl ketone	0·3	2·9

Plant Work Done

A steam heater was installed to heat the caustic washed gasoline just before mixing with the acid. This was the only change made to the process, which has been outlined elsewhere.[6] The gum content and colour of the re-run gasoline before and after oxidation have been used as the criterion of stability, and indicate that the product from the hot treatment with 70 per cent acid is in no way inferior to that obtained previously with 93 per cent acid at ambient temperatures.

Distillation of the re-run bottoms has shown that the proportion of about 34 per cent of true polymer and alkylate was maintained in the bottoms from both the new " hot " and the previous " cold " treatments.

DISCUSSION

The smaller increases in gum (Fig 1) and colour (Table I) after oxidation showed that increasing the treatment temperature from 30° to 90° F gave a more stable product when treating with 93 per cent acid. Since the increase in gum content on oxidation was not much greater when using 70 per cent than when using 93 per cent acid (Table II), the effect of temperature on the treatment with 70 per cent acid was then examined. The results (Table III) again confirmed the beneficial effect of temperature in producing a more stable product. A treatment temperature of 100° F was chosen as adequate for producing a stable product while not producing too great a yield of polymer. The minimum amount of 70 per cent acid required was then determined as between 0·49 and 0·55 per cent by volume to give a stable gasoline (Table IV).

The extraction of the tar acids by the 74 per cent acid (Table V) shows that, if the concentration in the gasoline feed is allowed to remain high, significant dilution of the acid can be expected. When using 93–98 per cent acid this dilution would have less effect on the treatment efficiency than when using 70 per cent acid. Consequently, greater care is necessary in removing the tar acids when using the weaker acid. It is of interest to note that the partition coefficient for the tar acids between the gasoline and the acid increased with the amount of tar acids extracted.

The addition of benzaldehyde prior to the treatment gave a small increase in the colour of the treated and redistilled gasoline, though methyl ethyl ketone did not. Since phenyl fulvene has a deeper colour than alkyl fulvenes,[7] the results suggest that there was a slight increase in the fulvene content of the gasoline.

Plant treatment of nearly 3 million gal of gasoline using 70–72 per cent acid at 100° F has proved to be easy of application, and has given a product quite as stable as that from the use of 93 per cent acid at ambient temperatures.

As yet the detailed economics of the alternative " hot weak acid " and " cold strong acid " treatments have not been finalized, but there appears to be little difference between them.

ACKNOWLEDGMENTS

The authors thank Mrs O. P. van Es, Miss D. A. M. Holmes, and L. D. Hulley for assistance in carrying out the work, and the Management of the South African Torbanite Mining and Refining Co. Ltd. for permission to publish this paper.

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PART IV. TREATMENT WITH AN ACID RESIN*

By GEO. E. MAPSTONE† and (Mrs) O. P. VAN ES†

SUMMARY

Treatment of gasoline with a sulphonated polystyrene resin instead of sulphuric acid greatly increased its oxidation stability but failed to remove all the pyrroles. Pyrrole polymer was found to be insoluble or sparingly soluble in most solvents but soluble in concentrated sulphuric acid. In normal acid treatment they are therefore extracted by the acid sludge.

INTRODUCTION

THE function of sulphuric acid when used for treating gasoline is two-fold, namely, it reduces the sulphur content of the gasoline and it removes potential gum-forming materials such as conjugated diolefins, pyrroles, etc. The mechanisms of the numerous reactions involved can be classified [1] into the following groups:

(i) solvent extraction, *e.g.* the removal of the lower aliphatic sulphides etc, and

(ii) polymerization and alkylation, *e.g.* the removal of conjugated diolefins, thiophenes, etc.[1, 2]

The polymerized and alkylated products are then removed either by solution in the acid sludge or subsequently as high boiling residue by redistillation of the treated gasoline.

In those cases where the solvent extraction reactions were of little or no importance but the main requirement of the process involved the polymerization reactions, it was felt that the use of a strong acid catalyst, such as a sulphonated polystyrene or sulphonated phenol formaldehyde resin, should give satisfactory results and possibly also fundamental information on some of the reactions involved.

The use of such resins was therefore examined.

EXPERIMENTAL

The sulphonated resins used were Nos. 2K–225 and 2K–215 manufactured by the Permutit Co. Ltd. They were washed with 10 per cent sulphuric acid and dried before use.

A quantity of resin was weighed into a Liebig condenser and held in place with a glass wool plug. Tap water was circulated through the condenser jacket to maintain a constant temperature. Gasoline, which had previously been washed with 10 per cent caustic soda to remove tar acids and 10 per cent sulphuric acid to remove tar bases, was passed through the column and successive 200-cc samples collected. These samples were then distilled at atmospheric pressure and, finally, under vacuum to give 4 per cent bottoms by volume. At no time was the bottom temperature allowed to rise above 300° F. The gum contents of the distillates were then determined by ASTM D381–50 before and after oxidation with oxygen under pressure.[3] After 4 hours' oxidation the gasoline was a brown-yellow colour and there was a precipitate on the bottom of the bottle, but the odour was still pleasant.

A second sample of the washed gasoline was refluxed for 2 hours with 4 per cent by weight of the resin. The gum contents before and after 4 hours' oxidation were determined. The oxidized gasoline again was brown-yellow with a precipitate on the bottom. The precipitate was filtered off and tested for the elements present; sulphur and nitrogen were found to be present. The results of these tests are given in Table I.

TABLE I

Results of Resin Treatment of Gasoline

Resin no.	Temp of treatment, °F	Wt of resin, g	Actual gum, mg/100 ml	Vol of P.D. treated, cc	Time of treatment, min
2K-225	69	21·3	16·2	800	80 *
2K-215	70	47·2	19·6	800	80 *
2K-225	185	32	14·2	800	120 †
2K-215	185	32	19·5	800	120 †

* Gasoline passed through bed.
† Refluxed for two hours.

A further sample of 800 cc of caustic and dilute acid washed gasoline was refluxed for four hours with 18 g of resin. Part of this treated gasoline was washed with 95 per cent ethanol in order to determine whether the washing removed the polymerized gum-forming products, such as pyrrole polymers. The washed, the unwashed, the refluxed, and the unrefluxed gasoline were then tested for pyrroles.[4] These four samples showed negligible differences in their pyrrole contents, indicating that the resin had not removed the pyrroles present.

A quantity of pyrrole polymer was prepared by the action of concentrated sulphuric acid on pure pyrrole. The solid products were washed with water, dried, and tested qualitatively for solubility in a number of reagents. The results obtained are given in Table II.

The gasoline solution of the polymer was distilled at atmospheric pressure to a maximum liquid temperature of 300° F. The distillate was tested and found

* MS received 23 January 1956.

† South African Mining and Refining Co. Ltd.

to be free of pyrroles, showing that the polymer was not decomposed at that temperature and that the washing of the polymer had removed all traces of free pyrrole.

TABLE II

Qualitative Solubility of Pyrrole Polymer

Solvent	Solubility
Concentrated sulphuric acid	Soluble
Glacial acetic acid	Slightly soluble
Syrupy phosphoric acid	Slightly soluble
Gasoline	Sparingly soluble
Acetone	Insoluble
Methyl ethyl ketone	Insoluble
Glycerine	Insoluble
Dioxane	Insoluble
95% Ethanol	Insoluble

The solution of the pyrrole polymer in the gasoline gave a positive reaction to the Erlich test for pyrroles,[4] indicating that the reagent either depolymerized or reacted directly with the polymer. Consequently, it did not distinguish between the monomer and the polymer.

DISCUSSION

Since the gum content of the untreated gasoline was of the order of 200 mg/100 ml, the results given in Table I show that contact with the resin had effected an appreciable though insufficient treatment. The presence of pyrroles in the treated and redistilled gasoline, while no pyrroles appeared in the distillate from a gasoline solution of pyrrole polymer, indicated that the resin failed to polymerize completely the pyrroles present; otherwise the treatment with the acid resin would appear to have been satisfactory.

The solubility data in Table II show that, in the normal treatment with sulphuric acid, the pyrrole polymer, as well as any unpolymerized pyrroles, is removed by solution in the acid sludge. It would appear that, when the acid resin was used, deposition of the insoluble polymer on the resin assisted in reducing its catalytic activity. This would also explain the change in the colour of the sulphonated polystyrene resin from amber to a reddish black, and the failure of all organic solvents tried to remove the colour. Consequently, it would appear possible to use an acid resin for the acid treatment of gasoline, but not if pyrroles are present as in shale gasolines.

ACKNOWLEDGMENTS

The authors wish to acknowledge with thanks the permission granted by the management of the South African Torbanite Mining and Refining Co. Ltd. for permission to publish this paper.

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THE INSTITUTE OF PETROLEUM

ANNUAL REPORT

For the Year Ending 31 December 1955

GENERAL

The year 1955 has been another year of steady progress, and in December the Council announced the purchase of 61 New Cavendish St., W.1, which is to be converted into the Institute's first permanent headquarters.

General Meetings

Ten General Meetings were held, and attendance continued to be satisfactory. The average number at each meeting was approximately sixty-five, of whom 37 per cent were visitors.

Annual Dinner

The Annual Dinner was held at Grosvenor House on 23 February, when the Minister of Fuel and Power, The Right Honourable Geoffrey Lloyd, M.P., was the chief speaker. Over 1200 members and guests attended the function.

Awards

The Second Award of the Institute of Petroleum Eastlake Medal, for long and meritorious service to the Institute, was made in November to Mr J. A. Oriel, C.B.E., M.C., and Sir Frank Smith was awarded the Honorary Fellowship of the Institute.

Studentship

Mr P. H. Huckin was awarded the Institute's Annual Prize at the Imperial College of Science and Technology, and Mr J. L. Chawner the Institute's Scholarship at the University of Birmingham.

A new Student's Prize, for the best paper submitted in any year has been inaugurated, and the first competition will take place in 1956.

Benevolent Fund

Two applications for assistance have been considered, and grants made in 1955.

Aviation Products Data Committee

The draft Aviation Lubricating Oil Data Sheets have been brought up to date and forwarded to the Royal Aeronautical Society, with a view to publication in the spring of 1956. Revision and extension of the Aviation Fuels Data Sheets are in progress, and it is hoped to publish these at the same time as the Lubricating Oil Data Sheets.

Economics and Operations Group

The Group has now become fully established, under the Chairmanship of Mr O. F. Thompson, and six meetings were held during the year. The Group continues to grow, and attendances at meetings were most satisfactory.

Branches

The eight U.K. Branches and the three overseas Branches of the Institute have all operated very successfully during 1955, with membership increasing and satisfactory attendances at meetings.

Mr H. E. F. Pracy was appointed the Branch Lecturer for 1955–56. The membership of the London Branch is now over 400.

The total membership of the U.K. Branches (October 1955) was 1555, made up of 928 Corporate Members, 591 Branch Members, and 36 Student Members.

House

The staff at Manson House has changed little during the year. Three members attended the Fourth World Petroleum Congress in Rome, and ran an Institute of Petroleum Enquiry Bureau for the benefit of Institute members, which was used considerably during the Congress.

Council has placed on record its appreciation of the loyal and efficient service of the staff of the Institute, which has contributed in no small measure to the progress made during 1955.

Finance

The Institute has again had a satisfactory year financially. It will be seen from the Annual Accounts that all the investments held on both Capital and Revenue Account have been realized to provide the purchase money for the new building.

Publications

Volume 41 of the *Journal* was published in twelve monthly parts and contained reports of the general

meetings of the Institute, together with papers specially contributed. Most aspects of the petroleum industry were covered in these papers. The *Journal* also contained over 1600 abstracts of current literature, and this section forms a valuable part of the *Journal*.

The *IP Review* for 1955 was much larger in volume than in previous years. Two special issues contributed to the increased size. The first of these dealt with the Fourth World Petroleum Congress and included summaries of the papers prepared for the various sections of the Congress and also gave much information likely to be of value to those who were visiting the Congress. The results of the Congress were also given wide publicity in a subsequent issue, and another special issue was devoted to the new oil refinery erected at Kwinana in Western Australia.

Other Publications

During 1955 a number of new publications of the Institute made their appearance, including "Applied Mass Spectrometry" and "Molecular Spectroscopy," both of which were published on behalf of the Hydrocarbon Research Group.

The 14th edition of "Standard Methods for Testing Petroleum and its Products" was published early in the year, and was accompanied by its companion volume "IP Engine Test Methods for Rating Fuels." Part 2 of the IP Safety Codes also made its appearance, this dealing with marketing operations.

Another important contribution to petroleum literature was the book "The Role of Petroleum in Modern Transport," which contained the papers and discussion at the 1954 Summer Meeting.

The second edition of the "IP Glossary of Petroleum Terms" appeared, and a number of separate volumes of the "ASTM/IP Petroleum Measurement Tables" were also prepared and published. These are designed for daily use in small installations, depots, and other places where the large volume might be found too cumbersome.

Amendments to the "IP Petroleum Measurement Manual" were also made available in a form for ready insertion in the manual itself.

At the end of the year the 15th edition of "Standard Methods," a "Library Catalogue," and a "List of Members" were in hand for publication.

Library

Considerable progress was made in the re-classification of the contents of the Library, and the "Library Catalogue" will make its appearance early in 1956. Use of the Library increased considerably during the year, and members and others continue to find it a valuable source of information.

Research

The Hydrocarbon Research Group has continued to sponsor research work at the Universities and Technical Colleges during the year.

The Research Group No. 2 has continued its co-operation with the Medical Research Council in investigations of the biological activity of petroleum fractions.

Engineering Committee

The revision of the "Refining Safety Code" occupied a considerable proportion of the year's work, and only at the end of the year was it in the hands of the printers.

The "Production Code" draft was checked by a sub-committee, and at the end of the year it required only final editing. It should be available for the printer in March–April 1956.

Major revisions of the "Electrical Code" were discussed, including the conception of "remotely dangerous" areas.

Requests for information and advice from public and private organizations were satisfactorily handled.

Standardization

The 15th Edition of "Standard Methods" is due for publication early in 1956, and work is proceeding

MEMBERSHIP

Details of membership as at 31 December 1955:

	Total 31 Dec. 1954	Changes during 1955						Total 31 Dec. 1955
		New	Transferred to	Resigned	Deceased	Transferred from	+ or −	
Honorary Members	2	—	—	—	—	—	—	2
Honorary Fellows	5	—	1	—	1	—	—	5
Members	608	33	3	20	5	6	+ 5	613
Fellows	642	57	17	11	6	2	+ 55	697
Associate Members	856	46	3	39	4	9	− 3	853
Associate Fellows	1031	134	9	44	2	6	+ 91	1122
Students	82	12	—	8	—	10	− 6	76
Totals	3226	282	33	122	18	33	+142	3368
Member Companies	180	8	—	+4	—	—	+4	184

on the 16th Edition. Of the seventy-six IP Methods, for which there are corresponding ASTM Methods, twenty-seven (35 per cent) are now considered to be technically equivalent to their ASTM counterparts.

Active co-operation with the British Standards Institution and with standardization bodies in other countries has continued. The Institute had strong representation on the British delegation at the meetings of Technical Committee 28 of the International Organization for Standardization held in London during June. Meetings were also arranged with representatives of the Co-ordinating Research Council to discuss co-operation on matters of mutual interest, and representatives of various interested organizations in the U.K. and Europe participated.

British National Committee of the World Petroleum Congress

More than 300 members and their wives attended the very successful 4th Congress held in Rome during June. The Committee arranged for the presentation of thirty British papers at the Congress.

DEATHS

The Council wish to express their sincere condolences to the families and friends of the following members who died during the year :

Sir Andrew Agnew (Hon.F)	F. Kind (F)
T. J. Bidstrup (F)	G. M. Lees (F)
J. T. B. Bowles (F)	C. MacKinnon (AM)
E. H. Clarke (AM)	M. Maung (F)
G. Egloff (F)	F. R. Pacey (F)
J. A. Green (M)	S. Robinson (M)
H. D. Gotts (AM)	F. H. Rogers (M)
H. L. Hawkes (AM)	J. F. P. Scallan (AF)
J. M. Hill (AM)	V. H. Stott (M)

Sir Andrew Agnew, Honorary Fellow, was President of the Institute from 1946 to 1948.

Dr G. M. Lees and Dr Gustav Egloff had both been members for over thirty years, and were international figures in the petroleum world.

Mr J. F. T. Bowles and Mr F. H. Rogers had also been members of the Institute for over thirty years.

By Order of the Council,

C. CHILVERS,
Honorary Secretary

March 1956

THE INSTITUTE

(A Company limited by Guarantee

BALANCE SHEET AS

1954 £	£		£ s. d.	£ s. d.	£ s. d.
		Capital of the Institute under Bye-Laws 36, 44, and 45 :			
		Life Membership Fund—			
1,009		As at December 1955		1,008 17 9	
		Entrance and Transfer Fees—	£ s. d.		
		As at 31 December 1954	7,339 2 9		
		Add Receipts during 1955—			
		Entrance Fees	365 8 0		
		Transfer Fees	13 13 0		
	7,339			7,718 3 9	
		Donations—			
	326	As at 31 December 1954		326 5 0	
				9,053 6 6	
		Less Loss on Sale of Investments held on Capital Account	569 14 1		
	*278**	*Less* Profit on Sale of Investments, brought forward	278 4 4		
				291 9 9	
8,952					8,761 16 9
5		**T. C. J. Burgess Prize Fund**			5 0 0
1,702		**General Reserve (previously War Contingencies Reserve)**			1,702 0 11
		Revenue Account :—			
		As at 31 December 1954		21,666 15 4	
		Add Surplus for year		10,994 5 6	
21,667					32,661 0 10
		Subscriptions Received in Advance :—			
		Members' Subscriptions for 1956		1,227 9 0	
		Members' Subscriptions for 1957		4 15 0	
		Members' Subscriptions for 1958		4 4 0	
		Members' Subscriptions for 1959		4 4 0	
		Member Companies' Subscriptions for 1956		680 5 0	
		Journal Subscriptions for 1956		1,189 14 7	
		Journal Subscriptions for 1957		32 3 10	
3,565					3,142 15 5
		Current Liabilities and Provisions :—			
	350	Provision for Pension		350 0 0	
	9,076	Sundry Creditors and Accrued Charges		6,787 13 5	
	312	World Petroleum Congress		65 19 8	
		Entertainment Account—	£ s. d.		
		As at 31 December 1954	1,029 2 0		
		Less Excess of Expenditure over Receipts during year to date	920 16 1		
	1,029			108 5 11	
10,767					7,311 19 0
		Sum Set Aside for Grants to Branches and Students' Section—unallocated :			
		Balance, as at 31 December 1954		89 3 0	
		Add Amount set aside during year		650 0 0	
				739 3 0	
89		*Less* Grants made during year		575 0 0	
					164 3 0
£46,747					£53,748 15 11

* Profit.

AUDITORS' REPORT TO THE MEMBERS

We have examined the above Balance Sheet and annexed Revenue Account and report that we have obtained all the
In our opinion, proper books of account have been kept by the Institute, so far as appears from our examination of those
best of our information and according to the explanations given to us, the accounts give the information required by the
affairs at 31 December 1955, and the Revenue Account gives a true and fair view of the revenue for the year ended on that

88 Leadenhall Street,
London, E.C.3.
1 *March* 1956.

OF PETROLEUM

and not having a Share Capital)

AT 31 DECEMBER 1955

1954 £	£		£	s.	d.	£	s.	d.
		Leasehold Premises :—						
		Cost of acquisition				19,998	10	0
		(*Note :* It is estimated that rehabilitation costs will amount to £51,200)						
		Investments :—						
	5,187	*On account of Capital, at cost*				—	—	—
	3,766	Cash on Deposit with Post Office Savings Bank				—	—	—
8,953								
						19,998	10	0
8,975		*On account of Revenue, at cost*				—	—	—
		Office and Library Furniture :—						
		At valuation, being Net Amount standing in the Company's books at 1 July 1948, *less* Sales	221	10	8			
		At Cost	2,766	10	1			
			2,988	0	9			
		Less Aggregate Depreciation	1,147	5	8			
1,763						1,840	15	1
		Current Assets :—						
	3,876	Stock of Publications in hand, as certified by the General Secretary	6,186	3	6			
	394	Stock of Envelopes (for dispatch of *Journals*)	434	11	4			
		Sundry Debtors and Payments in advance, including Income Tax recoverable	£ 6,527	s. 12	d. 3			
		Less Provision for Doubtful Debts	75	0	0			
	6,325		6,452	12	3			
	—	Subscriptions in arrear (not valued)	—	—	—			
		Cash on Deposit with Post Office Savings Bank—						
	263	General Account	341	17	7			
	312	World Petroleum Congress	65	19	8			
			407	17	3			
		Cash at Bank—						
	10,000	Deposit Account	14,402	14	3			
	4,257	Current Account	3,317	6	4			
	1,029	Entertainment Account	108	5	11			
			17,828	6	6			
	600	Cash in Hand	600	0	0			
27,056						31,909	10	10
£46,747						£53,748	15	11

OF THE INSTITUTE OF PETROLEUM

information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. books. The Balance Sheet and Revenue Account are in agreement with the books of account. In our opinion, and to the Companies Act, 1948, in the manner required, and the Balance Sheet gives a true and fair view of the state of the Institute's date.

SMITH & WILLIAMSON,
Chartered Accountants.
Auditors.

THE INSTITUTE

(A Company limited by Guarantee

REVENUE ACCOUNT FOR THE

1954 £	£		£ s. d.	£ s. d.
		To Administrative Expenses :		
10,365		Staff Salaries and National Insurance	11,419 16 4	
1,193		Staff Pension Scheme Contributions	1,056 9 2	
11,558			12,476 5 6	
5,547		*Less* Applicable to Publications	6,684 3 1	
6,011				5,792 2 5
	1,241	Printing and Stationery	1,230 2 10	
	793	General Postages	968 12 11	
	287	Telephones, Cables, and Travelling Expenses	286 8 4	
	2,321		2,485 4 1	
	774	*Less* Applicable to Publications—one-third	828 8 1	
1,547				1,656 16 0
74		Audit Fee	73 10 0	
196		General Expenses	173 19 3	
41		Insurance	46 6 4	
				293 15 7
7,869				7,742 14 0
		„ **Establishment Expenses :**		
	2,500	Rent	2,579 8 11	
	534	Cleaning, Lighting, and Heating	589 9 1	
	104	Repairs and Maintenance	37 18 8	
	3,138		3,206 16 8	
	784	*Less* Applicable to Publications	781 16 11	
2,354				2,424 19 9
		„ **Meetings :**		
479		Hire of Hall, Preprints, Reporting, etc.		469 16 3
600		„ **Sum Set Aside for Grants to Branches and Students' Section**		650 0 0
		„ **Sundries :**		
		Library Expenses	278 6 7	
		Subscriptions to Societies	73 15 6	
		Scholarship Awards	100 0 0	
		Depreciation of Furniture (10%)	210 6 8	
516				662 8 9
—		„ **Loss on Sale of Investments Held on Revenue Account**		1,189 0 3
5,833		„ **Balance, being Surplus Revenue for Year**		10,994 5 6
£17,651				£24,133 4 6

OF PETROLEUM

and not having a Share Capital)

YEAR ENDED 31 DECEMBER 1955

1954		£	*s.*	*d.*
£				
10,419	By Members' Subscriptions received for 1955	10,925	10	0
193	,, Members' Subscriptions in Arrear, received during year	184	16	6
8,600	,, Member Companies' Subscriptions received for 1955	8,746	4	6
16	,, Member Companies' Subscriptions in Arrear, received during year	—	—	—
20	,, Special Subscription	20	0	0
537	,, Interest and Dividends Received (Gross)	848	13	0
	,, Publications Revenue Account :			
—2,134	Surplus for year	3,408	0	6
£17,651		£24,133	4	6

PUBLICATIONS

Revenue Account for the Year ended 31 December 1955

	£	s.	d.		£	s.	d.
To Stock in Hand at 1 January 1955	3,876	7	0	By Advertising	16,635	19	4
„ Dispatch Expenses	1,048	11	0	„ Standard Methods (14th Edition)	3,479	15	0
„ Standard Methods (14th Edition)	1,189	9	11	„ Journal	3,308	13	8
„ Journal	6,945	15	7	„ Glossary	82	19	0
„ Glossary	47	8	0	„ IP Review	422	18	6
„ IP Review	7,220	14	4	„ Role of Petroleum in Modern Transport	359	17	6
„ Role of Petroleum in Modern Transport	563	13	10	„ Modern Petroleum Technology (Vol. 2)	1,849	15	0
„ Modern Petroleum Technology (Vol. 2)	317	12	0	„ Reviews of Petroleum Technology	522	17	6
„ Reviews of Petroleum Technology	980	18	11	„ Petroleum Measurement Manual	262	19	0
„ Petroleum Measurement Manual	140	17	6	„ Handy Tables	696	12	6
„ Handy Tables	1,771	18	4	„ IP Engine Test Methods for Rating Fuels	554	5	0
„ IP Engine Test Methods for Rating Fuels	237	18	5	„ Marketing Code	803	9	6
„ Marketing Code	505	5	8	„ Significance of Properties of Petroleum Products	157	10	0
„ Other Publications	99	2	4	„ Post-war Expansion of U.K. Petroleum Industry	83	12	6
„ List of Members	61	15	10	„ Other Publications	598	7	6
„ Abstracts	244	9	6	„ Electrical Code	491	8	6
„ Publicity	60	10	2	„ Tables for Measurement of Oil (British Edition)	479	14	0
„ Brochures	152	11	7	„ Tables for Measurement of Oil (Metric Edition)	473	13	0
„ Salaries, National Insurance, and Pension Scheme Contributions	6,684	3	1	„ Stock in Hand at 31 December 1955	6,186	3	6
„ Proportion of Administrative Expenses	828	8	1				
„ Proportion of Establishment Expenses	781	16	11				
„ Bad Debts written off, and Provision for Doubtful Debts	283	2	0				
	34,042	10	0				
„ Balance, being Surplus for year carried to Revenue Account	3,408	0	6				
	£37,450	10	6		£37,450	10	6

HYDROCARBON RESEARCH GROUP

Revenue Account for the Year ended 30 September 1955

	£	s.	d.	£	s.	d.
Grants :						
King's College	1,195	0	0			
University of Oxford	600	0	0			
University of Oxford (Professor Robinson)	600	0	0			
University of Birmingham	1,000	0	0			
University of Bristol	1,000	0	0			
Queen Mary College	1,626	0	0			
University of Liverpool	650	0	0			
University of Cambridge	1,000	0	0			
	7,671	0	0			
Less Refunded University of Oxford (Professor Robinson)	91	0	0			
				7,580	0	0
,, Honoraria				420	0	0
,, General Expenses				39	1	1
,, Wages				350	0	0
,, Expenses re "Applied Mass Spectrometry"				821	5	5
				£9,210	6	6

	£	s.	d.
By Voluntary Contributions from Members of the Group	8,000	0	0
,, Sales of "Applied Mass Spectrometry"	378	0	0
,, Sales of "Mass Spectrometry"	119	5	0
,, Surplus from Mass Spectrometry Conference	200	18	3
,, Stock in Hand of "Applied Mass Spectrometry"	234	0	0
,, Balance, being Deficit for year	278	3	3
	£9,210	6	6

Notes :

(i) For convenience in administration, the Accounts of the Group are closed as at 30 September each year.

(ii) The Group is now liable to bear all losses incurred in connexion with their publications.

Statement of Funds at 30 September 1955

	£	s.	d.	£	s.	d.
Sundry Creditor—The Institute of Petroleum				1,080	17	11
Revenue Account :						
As at 30 September 1954	1,673	5	1			
Less Deficit for year	278	3	3			
				1,395	1	10
				£2,475	19	9

	£	s.	d.
Publication Costs of Proceedings of Molecular Spectroscopy Conference (no sales during year to 30.9.55)	375	2	6
Stock in Hand of "Applied Mass Spectrometry"	234	0	0
Cash at Bank on Current Account	1,866	17	3
	£2,475	19	9

We have examined the above Revenue Account and Statement of Funds with the books and vouchers of the Group and find them to be in accordance therewith.

88 Leadenhall Street,
London, E.C.3.
1 *March* 1956.

Smith & Williamson,
Chartered Accountants,
Auditors.

CARCINOGENICITY RESEARCH FUND

Statement of Funds as at 31 December 1955

	£ s. d.	£ s. d.		£ s. d.
Balance of Sum Received from the Petroleum Board (during 1947)		450 0 0	**Cash at Bank on Current Account**	451 3 8
Accumulated Net Income :				
Interest on Bank Deposit Account, as at 1 January 1955	4 10 1			
Less Purchase of Leaflets	3 6 5			
		1 3 8		
		£451 3 8		£451 3 8

We have examined the above Statement of Funds with the books and vouchers of the Fund and find it to be in accordance therewith.

88 Leadenhall Street,
London, E.C.3.
1 *March* 1956.

Smith & Williamson,
Chartered Accountants.
Auditors.

CADMAN MEMORIAL FUND

Income and Expenditure Account for the Year ended 31 December 1955

	£ s. d.	£ s. d.		£ s. d.
To **Balance as at 31 December 1955 :**			By **Balance at 31 December 1954**	3,305 9 2
Cash at Bank on Deposit Account	500 0 0		„ **Interest received (Gross)**	93 11 0
Cash at Bank on Current Account	169 0 2			
£2,730 3% Savings Bonds 1965/75	2,730 0 0			
(Market Value at 31 December 1955—£2,170)		3,399 0 2		
		£3,399 0 2		£3,399 0 2

We have examined the above Income and Expenditure Account with the books and vouchers of the Fund and find it to be in accordance therewith.

88 Leadenhall Street,
London, E.C.3.
1 March 1956.

Smith & Williamson,
Chartered Accountants.
Auditors.

BENEVOLENT FUND

Income and Expenditure Account for the Year ended 31 December 1955

1954 £		£ s. d.	£ s. d.	*1954* £		£ s. d.
205	To **Grants Paid**		105 0 0	*3,198*	By **Balance at 31 December 1954**	3,268 16 11
	„ **Balance at 31 December 1955 :**			*206*	„ **Subscriptions and Donations received during year**	180 10 8
	Represented by—			*70*	„ **Interest Received (Gross)**	76 4 7
	Sundry Debtors	38 16 6				
	Cash at Bank on Current Account	431 15 8				
	Cash at Bank on Deposit Account	900 0 0				
	£200 3% Defence Bonds	200 0 0				
	£1,550 2½% Defence Bonds	1,550 0 0				
	£300 3½% Defence Bonds	300 0 0				
3,269			3,420 12 2			
	(Market Value of Investments at 31 December 1955, £2,050)					
£3,474			£3,525 12 2	*£3,474*		£3,525 12 2

We have examined the above Income and Expenditure Account with the books and vouchers of the Fund and find it to be in accordance therewith.

88 Leadenhall Street,
London, E.C.3.
1 *March* 1956.

Smith & Williamson,
Chartered Accountants.
Auditors.

THE INSTITUTE OF PETROLEUM

FORTY-THIRD ANNUAL GENERAL MEETING

THE Forty-third Annual General Meeting of the Institute of Petroleum was held at 26 Portland Place, London, W.1, on 25 April 1956, the chair being taken by Lt.-Col. S. J. M. Auld, O.B.E., M.C., D.Sc., President of the Institute.

The General Secretary read the notice convening the meeting and the minutes of the Forty-second Annual General Meeting, which were confirmed and signed as a correct record.

ELECTION OF OFFICERS FOR THE SESSION 1956–57

President

Lt.-Col. S. J. M. Auld said that the Council had unanimously adopted the recommendation of the Committee of Past-Presidents that the Rt. Hon. Lord Geddes be invited to become President for the ensuing year, and he had much pleasure in putting that proposition to the meeting.

C. A. P. Southwell, seconding the proposal, said that it gave him much pleasure to do so and to welcome Lord Geddes. He thought the Institute was extremely fortunate in the choice of their new President.

The resolution was carried unanimously.

Vice-Presidents

Lt.-Col. S. J. M. Auld proposed and F. L. Garton seconded the Council nominations that E. LeQ. Herbert and R. B. Southall be elected vice-presidents of the Institute for a term of three years. This was carried unanimously.

Council

The General Secretary announced that as six nominations had been received for the six vacancies on the Council there was no ballot and the following members were declared elected :

M. E. Hubbard	A. T. Wilford
A. J. Ruthven-Murray	C. G. Williams
G. H. Smith	C. S. Windebank

Honorary Treasurer

F. L. Garton proposed that G. H. Coxon be re-elected Honorary Treasurer for the year 1956–57. M. E. Hubbard seconded the proposal, which was carried unanimously.

Honorary Secretary

F. L. Garton proposed and J. H. Moore seconded that C. Chilvers be re-elected Honorary Secretary for the year 1956–57. The proposal was carried unanimously.

Ex-officio Members of Council

The following were nominated as ex-officio Members of Council :

S. A. Berridge	P. F. Ellis
A. S. Brooman	J. C. Jewell
G. M. Davies	W. M. Stirling

The nominations were proposed by Lt.-Col. S. J. M. Auld, seconded by J. H. Moore, and carried unanimously.

MEMBERS ELECTED OR TRANSFERRED

A list of Honorary Members, Honorary Fellows, Members, Fellows, Associate Members, Associate Fellows, and Student Members elected or transferred during 1955 was tabled in conformity with Bye-law 52.

REPORT OF COUNCIL

C. Chilvers, presenting the Report of the Council, said : The past year has been one of steady progress with a net increase in membership of 142 and with four additional member companies, and all the usual functions of the Institute have been carried on smoothly. The officers of the Institute, and indeed the general body of members, are in fact most fortunate that the normal day-to-day activities of the Institute function with the smoothness of a well lubricated machine. This is due in no small measure to the efficient control exercised by the chairmen of the many committees of Council and in particular to the efficiency of our General Secretary, our Editor, and the permanent staff of the Institute. I would like once again to say how much their loyal service is appreciated.

The outstanding item during the past year has been the purchase of premises to be converted into our own permanent Headquarters. An architect who is a specialist in the adaptation of period buildings has been engaged, a firm of contractors has been appointed, and plans for this conversion have been agreed. The work is expected to begin shortly, and by this time next year should be nearing completion. Council is

satisfied that the Institute will have premises of which it can be justly proud.

The next item to which I would refer is the work of the Branches, to which Council attaches much importance. These Branches provide opportunities for formal and informal meetings of those connected with the oil industry in all its many phases, not only in London but also in provincial and overseas locations. It extends some of the amenities of the Institute to those who are not in fact corporate members, but many of these Branch members do in fact become full corporate members in due course, and the Branches are a valuable source for increasing the membership of the Institute.

Members will have realized from the references in the Annual Report to Publications that in this field the Institute has once again had a highly successful year. To those of us who know from the inside something of what goes on it is really amazing that such a small staff can produce such a large number of publications, all of which maintain the very high standard which has always been associated with the Institute's publications. We are very fortunate in our editorial staff and in our Publications Committee.

No comments on an Annual Report would be complete without some reference to standardization, since this is still one of the main functions of the Institute. A tremendous amount of work is put in by the Standardization Committee and its many sub-committees each year. Council attaches a great deal of importance to the co-operative work with other standardization bodies, not only with the BSI in the U.K. but also with the ASTM and corresponding organizations in other countries. A highlight of the year in this connexion was the meetings of Technical Committee 28 of the International Organization for Standardization which were held in London in June 1955.

In conclusion, I would refer to the highly successful Fourth World Petroleum Congress held in Rome last year and which was attended by more than 300 members of this Institute. All who had the opportunity of attending that Congress will have felt that their visit was very worth while and that the prestige of the Institute, which was the pioneer in developing the idea of holding these congresses, was well maintained.

With these brief comments Mr President I would like to move that the Annual Report of Council for the year 1955 be received and adopted.

This proposition was seconded by C. E. R. Sams and carried unanimously.

ACCOUNTS

H. Hyams : In presenting the annual accounts I would like to express my pleasure in having our Honorary Treasurer, Mr G. H. Coxon, here today. I am sure, that as the Hon. Officer responsible for the Institute's financial well-being, he will gain at least as much satisfaction as I do in now explaining to you the happy state of the Institute's finances.

Income

Our income from Corporate Members and Member Companies last year was £19,856, compared with £19,228 in 1954 and £18,741 in 1953.

The increase of £628 last year compares favourably with the rise of £487 in the previous year.

The number of Member Companies (184) remains constant, as does the income from this source of £8600 per annum. It is appropriate that we should express thanks annually to these Member Companies for their continued excellent support.

Expenditure

Operating expenditure totalled £20,240, compared with £18,920 in 1954, an increase of £1320. Of this increase £920 was taken up by salaries and pensions; this represents a rise of about 7½ per cent. The remaining £400 is attributable to increased expenditure on printing, stationery, postages, telephones, the library, scholarships, and subscriptions to societies. This £400 is only 2 per cent of our expenses under these various headings, and when one takes into account our expanding activities, increasing membership, and the ever climbing costs of administering a virile organization such as ours, I think we can pay a tribute to our General Secretary and his staff for having kept running costs so low.

I should make reference to one particular item which appears on the debit side of our Revenue Account. When we realized our investments to pay for our new Headquarters we entailed a book-keeping loss of £1189.

Publications

I think it is again desirable to make reference to the healthy state of the Publications Account.

The year 1955 was indeed an excellent one. Our turnover from advertisements and sales of a wide variety of publications, including increase in stocks of publications, totalled £33,570 compared with £21,710 in 1954, *i.e.* an increase of about £12,000. Against this, our expenditure on publications was about £6300 higher. This enabled us to carry forward a surplus of £3400 from our Publications Account to our Revenue Account last year and was to a large extent responsible for the overall surplus of nearly £11,000 in our Revenue Account in 1955.

I think I should utter a word of warning here in case members should get wrong ideas into their heads about our ever growing surpluses.

It is hardly likely that the bumper year of 1955 in our Publication efforts will be repeated for some considerable time. Revenue from advertisements in our *Journal* and *Review* rose by nearly £3000, largely because of two special numbers of the *Review* which appeared in connexion with the Fourth World Petroleum Congress and in respect of the new oil refinery erected at Kwinana. A wide variety of other publications also sold well and helped to give us the handsome surplus referred to.

This warning against undue optimism regarding future substantial surpluses should not, however, blind us to the need for expressing the Institute's grateful thanks to those who were so largely responsible for this remarkable year of publications activity and success—the Hon. Editor, Dr E. B. Evans; the Hon. Associate Editor, D. L. Samuel; and their co-workers in the Publications Committee and the Publication Costs Sub-Committee; and Mr Hough our General Secretary, Mr Sell the Editor and Publications Manager, and Mr Noble our Advertisement Manager.

Balance Sheet

I would like to turn for a moment to two items in our Balance Sheet.

It will be noted that we have realized the whole of our Capital and Revenue Investments to enable us to pay approximately £20,000 towards the cost of our new Headquarters. This is only about a quarter of the money we must find to complete the rehabilitation and furnishing of the new home, hence the appeal which has recently been launched for donations to the Building Fund.

The second item is £920 representing excess of expenditure over receipts in our Entertainment Account. 1955 was an abnormal year for relatively large scale entertainment by the Institute. We joined with the BSI in entertaining, in London, overseas delegates to the second meeting of the Petroleum Products Committee of the International Organization for Standardization; we were hosts to delegates from the U.S.A. and from a number of European countries who participated in a meeting organized by the Institute to discuss matters of common interest with the U.S. Co-ordinating Research Council; and, as shown in the Annual Report, we had three members of the staff in Rome for the Fourth World Petroleum Congress, running a highly successful Enquiry Bureau and thus advancing the status of the Institute.

Mr President, the provision of £20,000 from our resources towards the cost of our new home is a clear indication of the soundness of our finances and the excellent progress we have made in recent years. And with these observations I have pleasure in moving the adoption of the Accounts for the year 1955.

The proposal was seconded by G. H. Coxon, who said that publications accounted for £37,000 of business done in the past year—quite a large sum for so small an institute. He thanked the Finance Committee for the work it had done in connexion with the acquisition of new premises; and he thought that members could look forward to a very satisfactory year. The proposal was carried unanimously.

AUDITORS

H. Hyams proposed and G. H. Coxon seconded that Messrs Smith and Williamson be re-appointed auditors at a remuneration to be agreed by Council. This was approved.

THE PRESIDENT

Lt.-Col. S. J. M. Auld, on inducting the Rt. Hon. Lord Geddes in the chair, said: The choice of a new president is indeed wisely made. Lord Geddes is a man of very considerable mental ability and combines the attributes of forcefulness and wisdom extremely well. He spent his apprenticeship in oil with the Shell Group in the U.S.A., and that is greatly to our present advantage. We are also well aware of his tanker interests, and it is a long time since we had a tanker man in the presidential chair.

For the past six years, Lord Geddes has been the chairman of the Admiralty Fuel and Lubricants Advisory Committee, and has worked closely with a large number of the members of the Institute. We are very glad and proud to think that Lord Geddes will carry on the established traditions of the Institute and he will also add to them. It is indeed with great pleasure and sincere trust in the future that I ask Lord Geddes now to take the chair.

Lord Geddes thereupon took the chair.

Thanks to Retiring President

C. Chilvers: It falls to me to express on behalf of the members of the Institute our very real appreciation of the services which Lt.-Col. Auld has rendered while serving his fourth term in the highest office of the Institute.

We created a precedent in electing Lt.-Col. Auld for a second two-year period, and I am quite sure no one has regretted the step which was then taken.

This has been a period of great development for the Institute—a number of most important decisions have had to be taken, and we have been most fortunate as a Council in having Lt.-Col. Auld as our leader during this period.

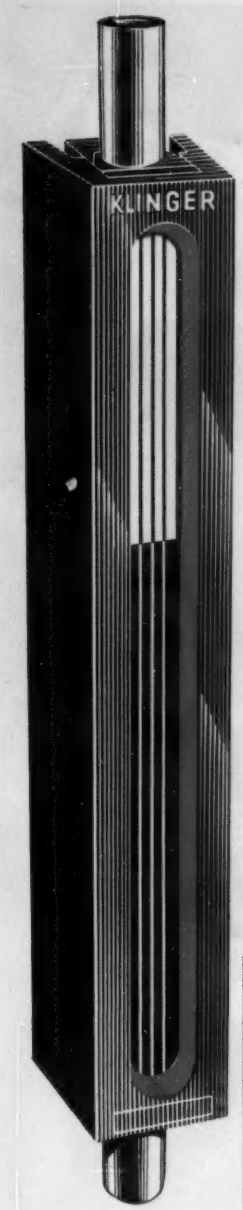
I have had the good fortune to have been closely associated with Lt.-Col. Auld on matters of one kind or another related to the petroleum industry for a good many years, and I have always had the highest regard for his clear sightedness and for his ability to direct affairs quietly and without fuss, yet most effectively.

We thank you, Sir, for all that you have done for the Institute during the past two years, and I would ask the Meeting to agree that we should record our appreciation in the minutes of this meeting.

Lord Geddes: Lt.-Col. Auld and I have worked very closely together for the past five years. We have made several visits to America together, and although I have not had the privilege of seeing him at work here, I have elsewhere, and I have an enormous respect for his ability and his skill in getting around difficult corners. I very strongly support what Mr Chilvers has said.

Lt.-Col. S. J. M. Auld: I must thank you, Mr President, and you, Mr Chilvers, for the nice things you have said, and I feel very deeply about them.

Lord Geddes then declared the meeting closed.



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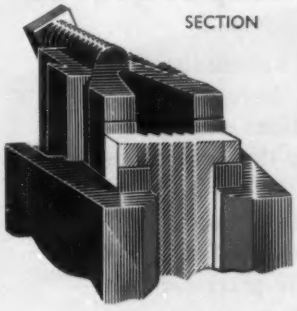

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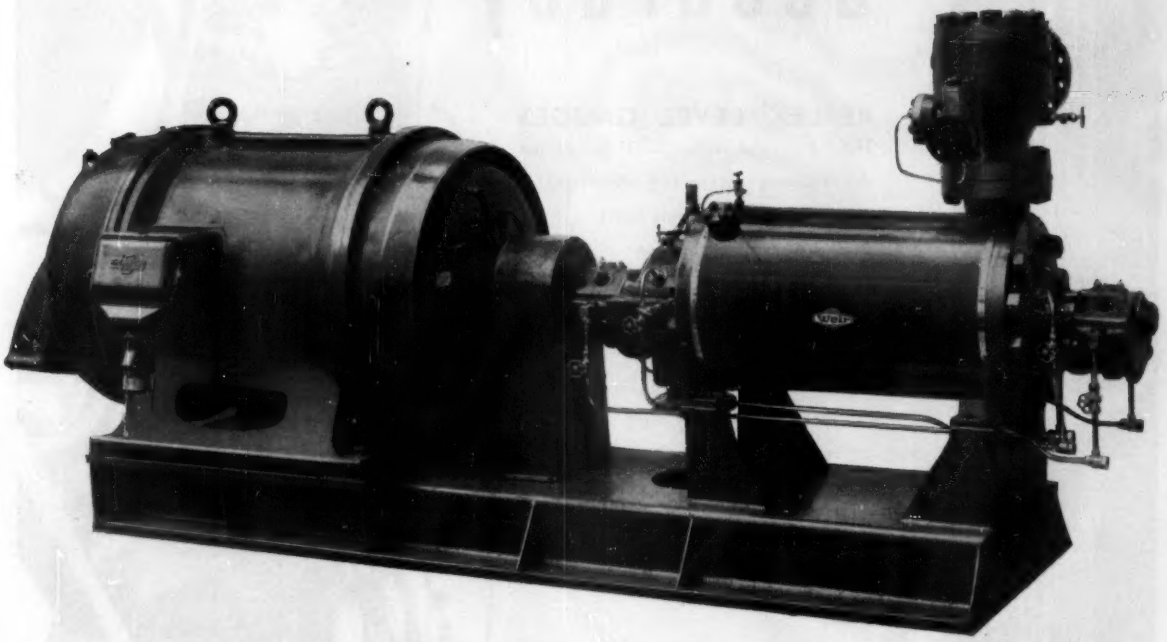

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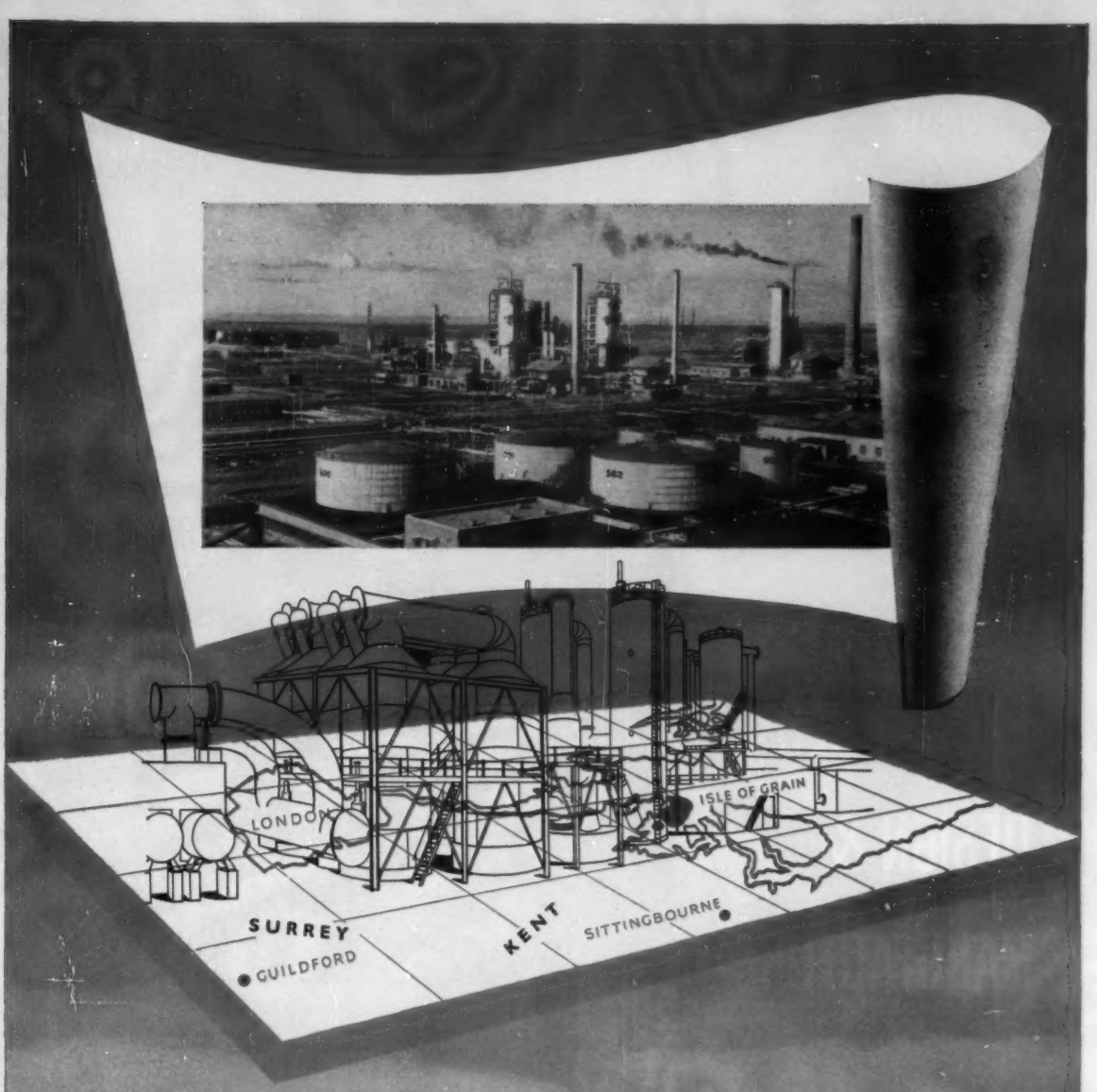

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Work is in progress on the installation of four Segas Catalytic Oil-Gas units to produce 16-20 million cubic feet of town gas per day from a variety of refinery residual products at the Isle of Grain Refinery of the British Petroleum Co Ltd. The South Eastern Gas Board will distribute the gas through their grid system.

220

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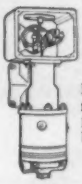

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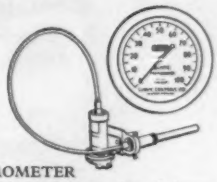

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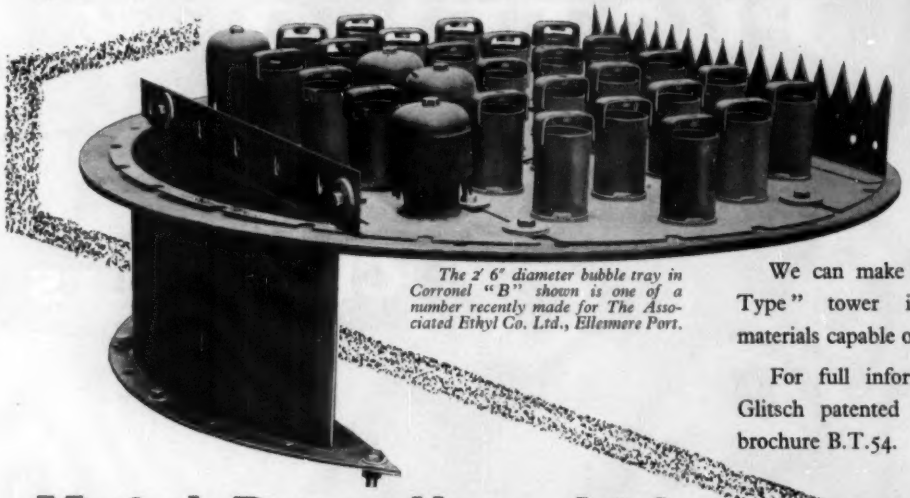

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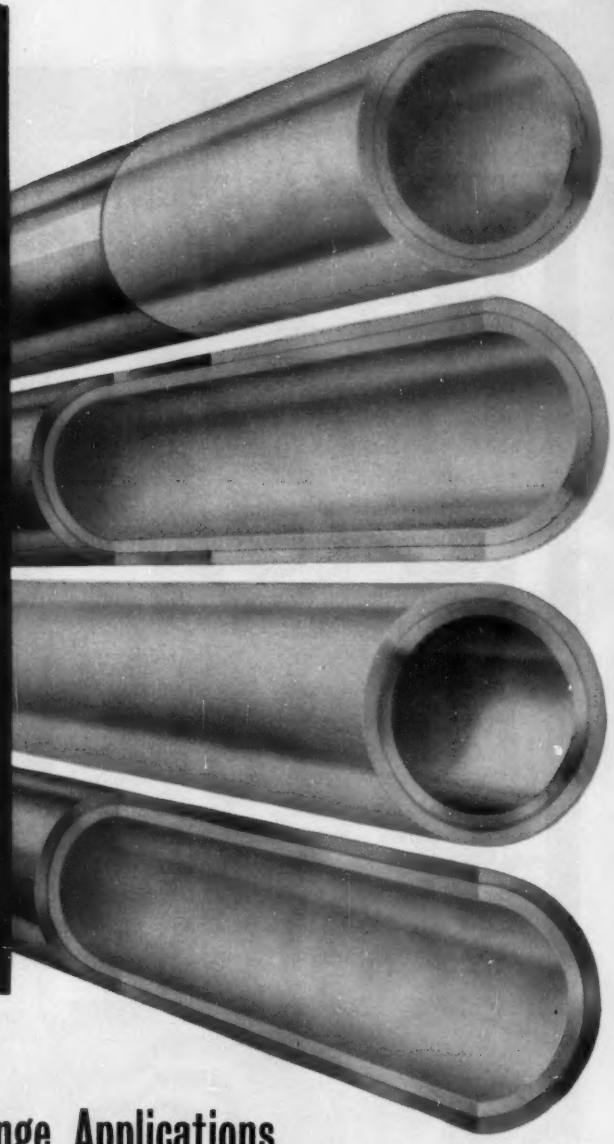

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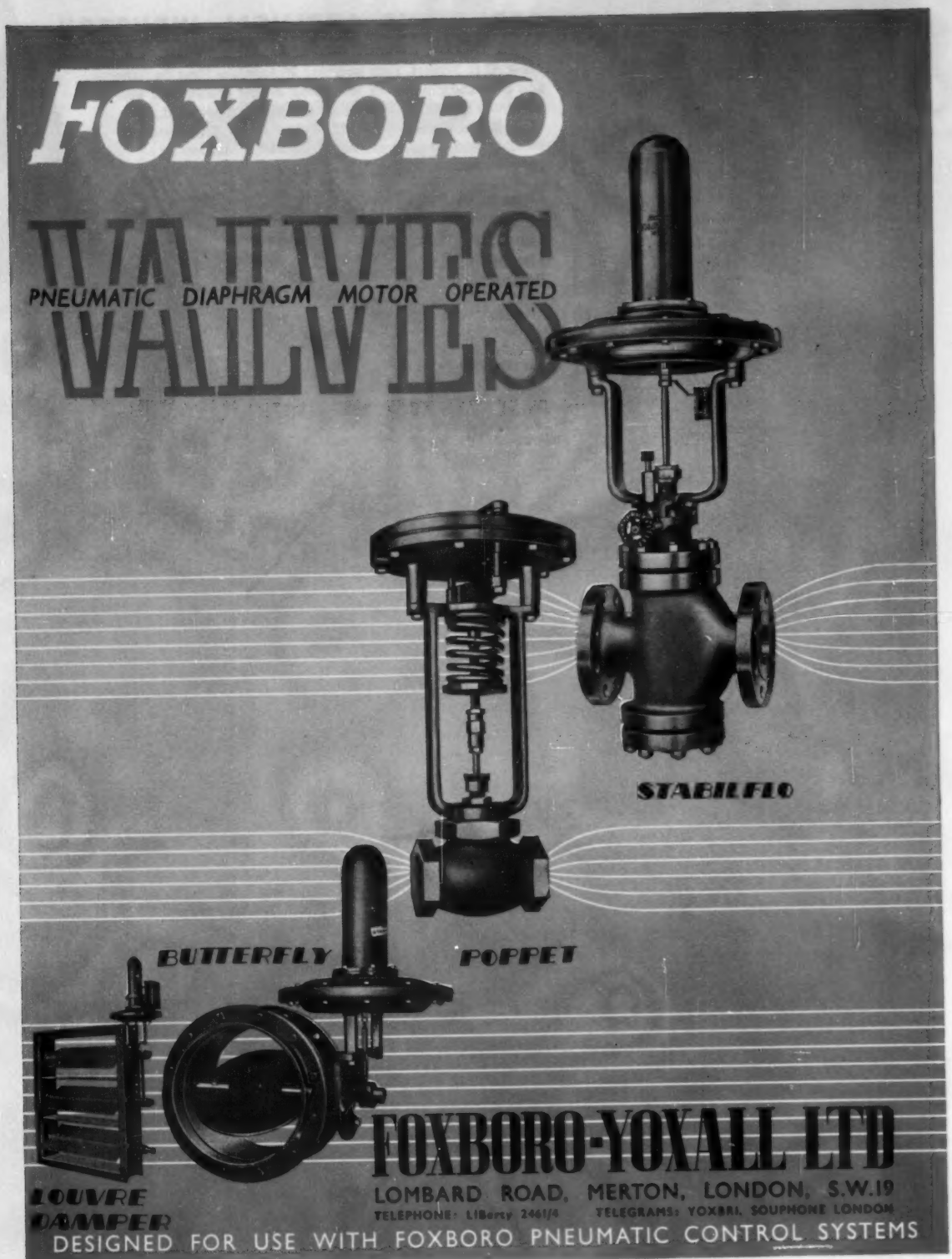
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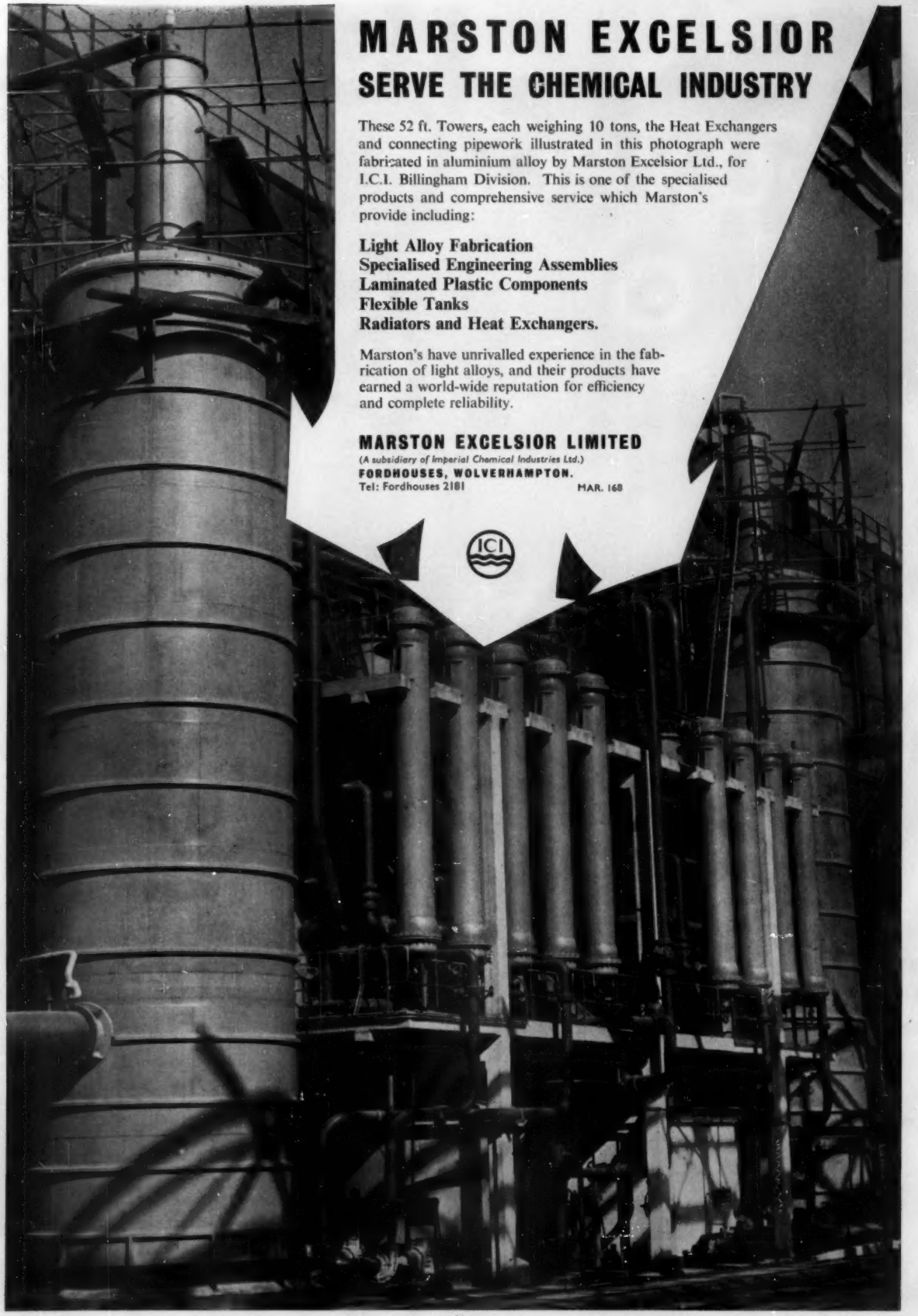
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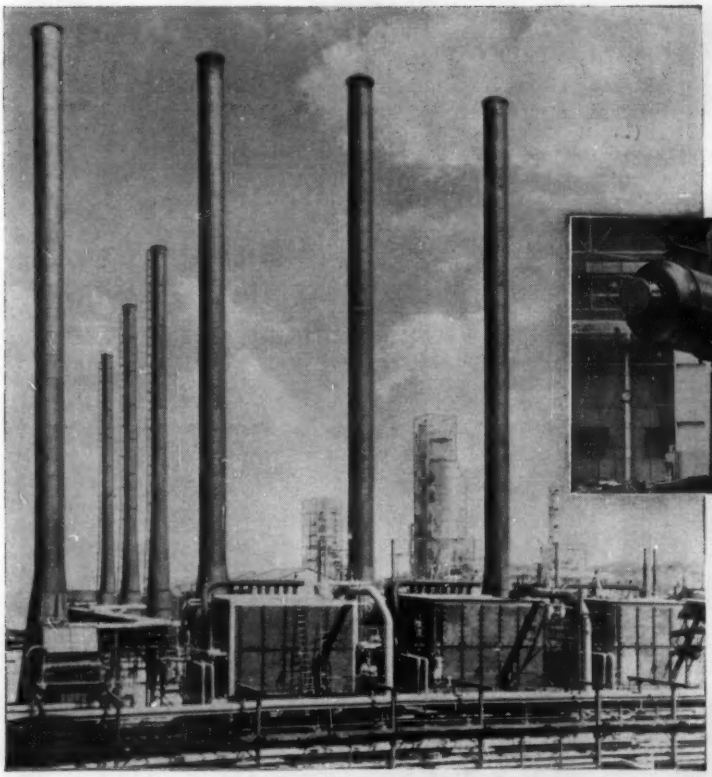
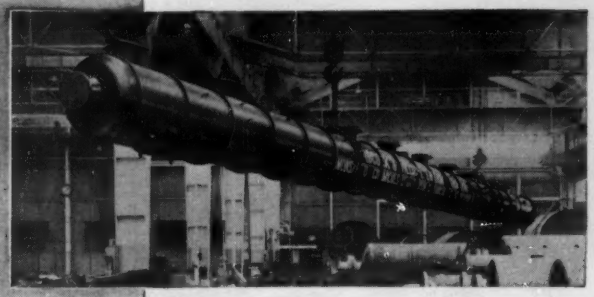


(left)
Babcock oil-fired boiler plant at Burmah-Shell refinery, Trombay, India.



(above)
Babcock fusion-welded treating tower for a Scottish chemical plant.

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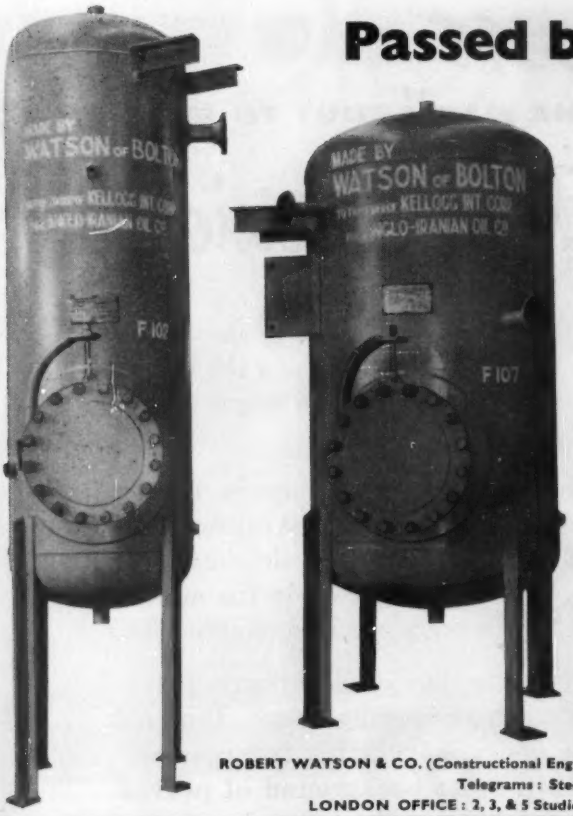

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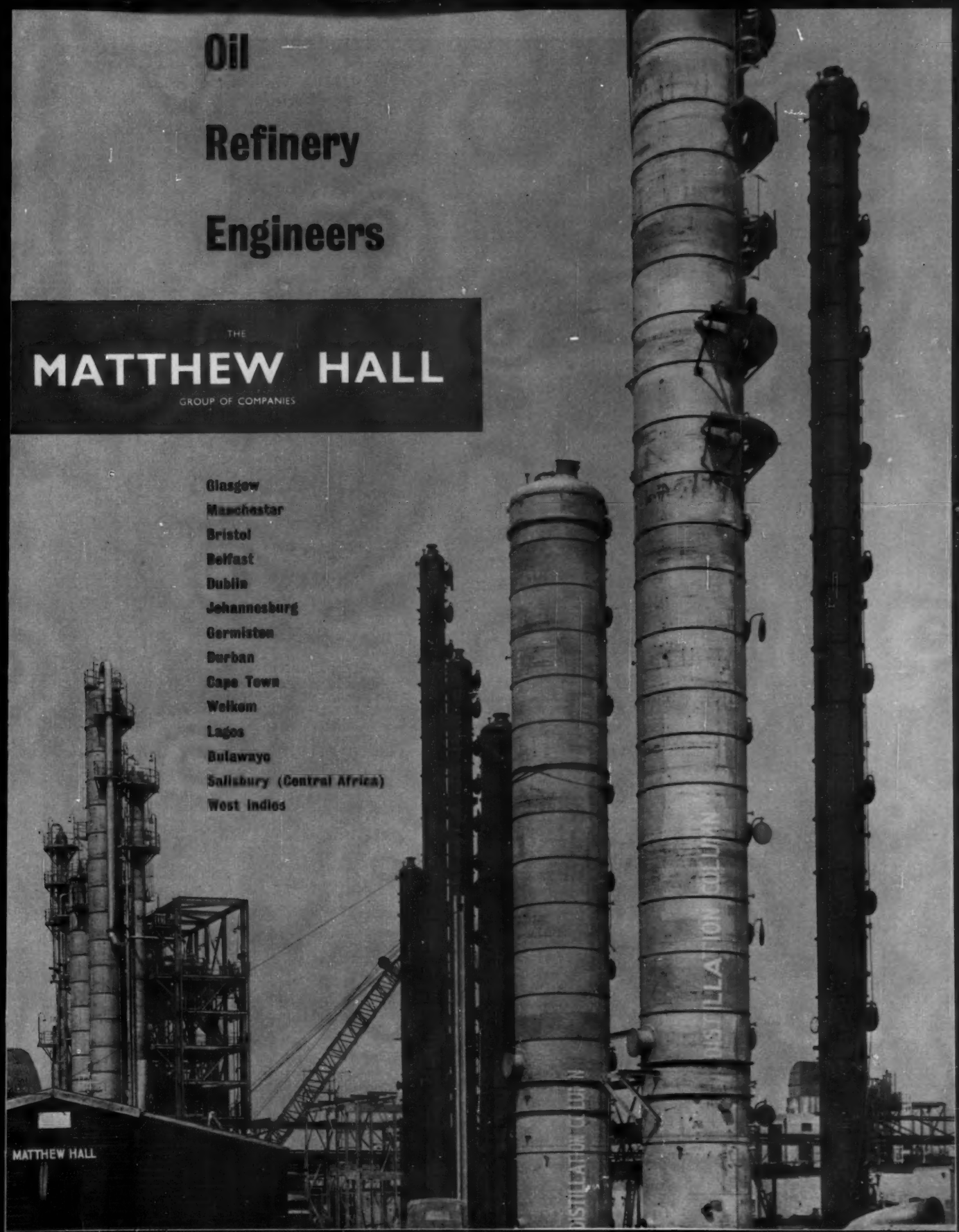

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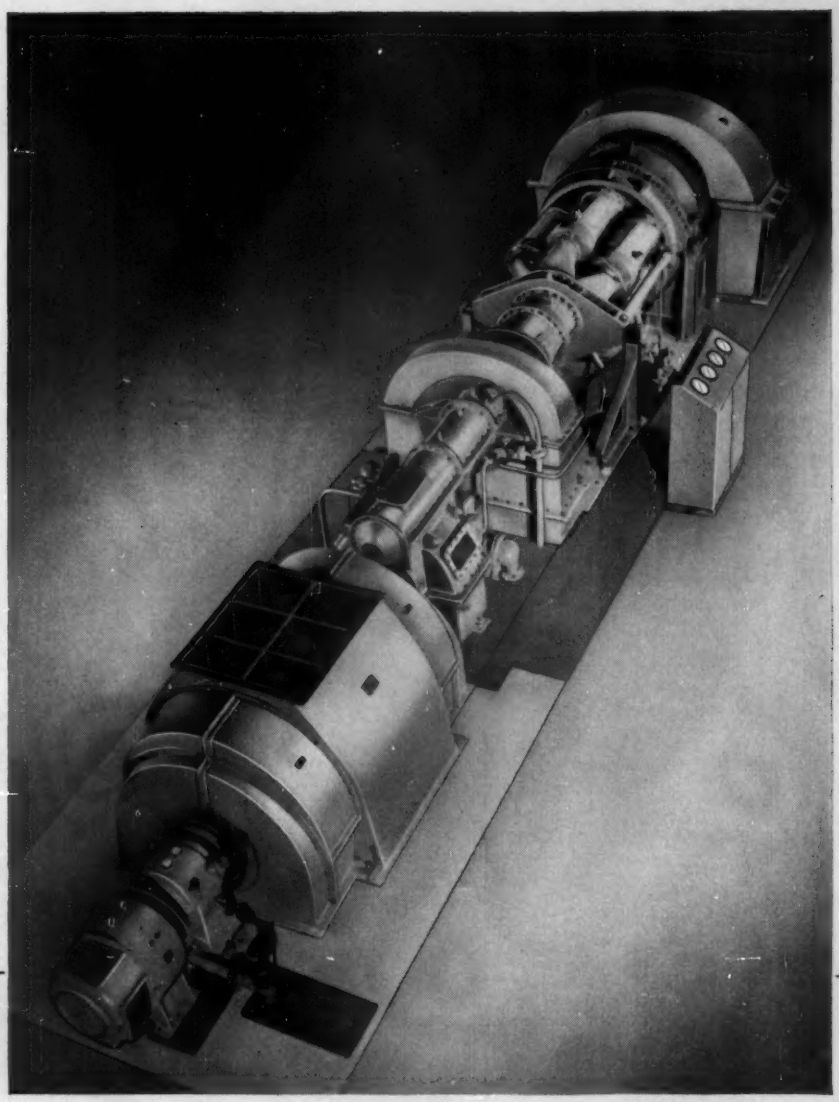

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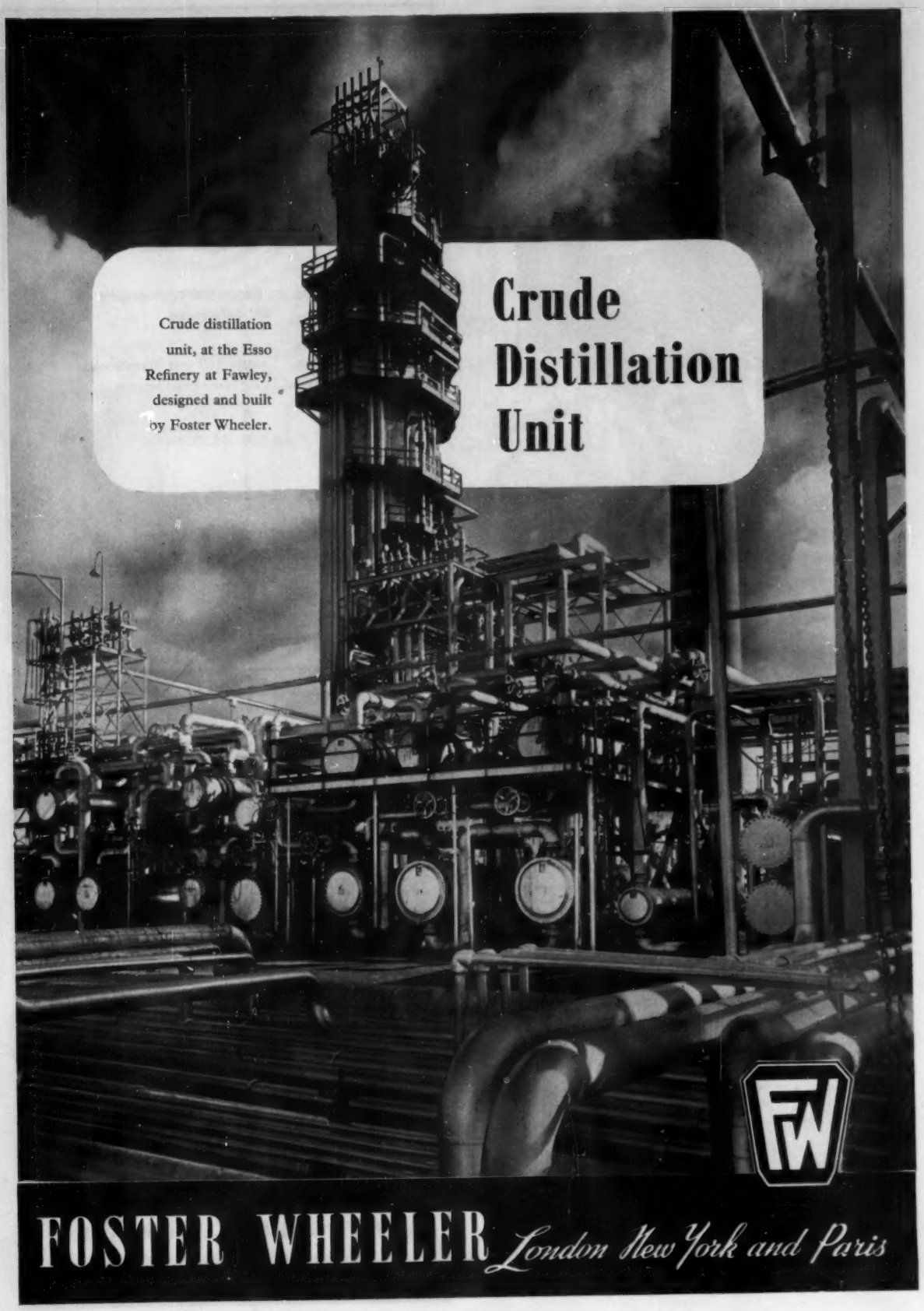
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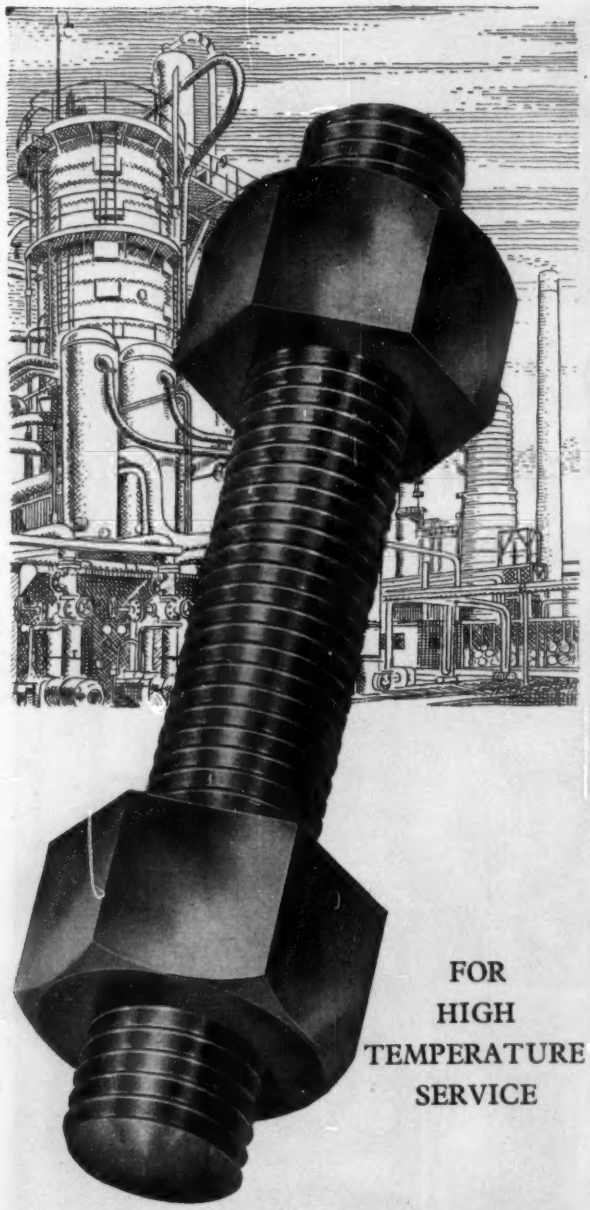

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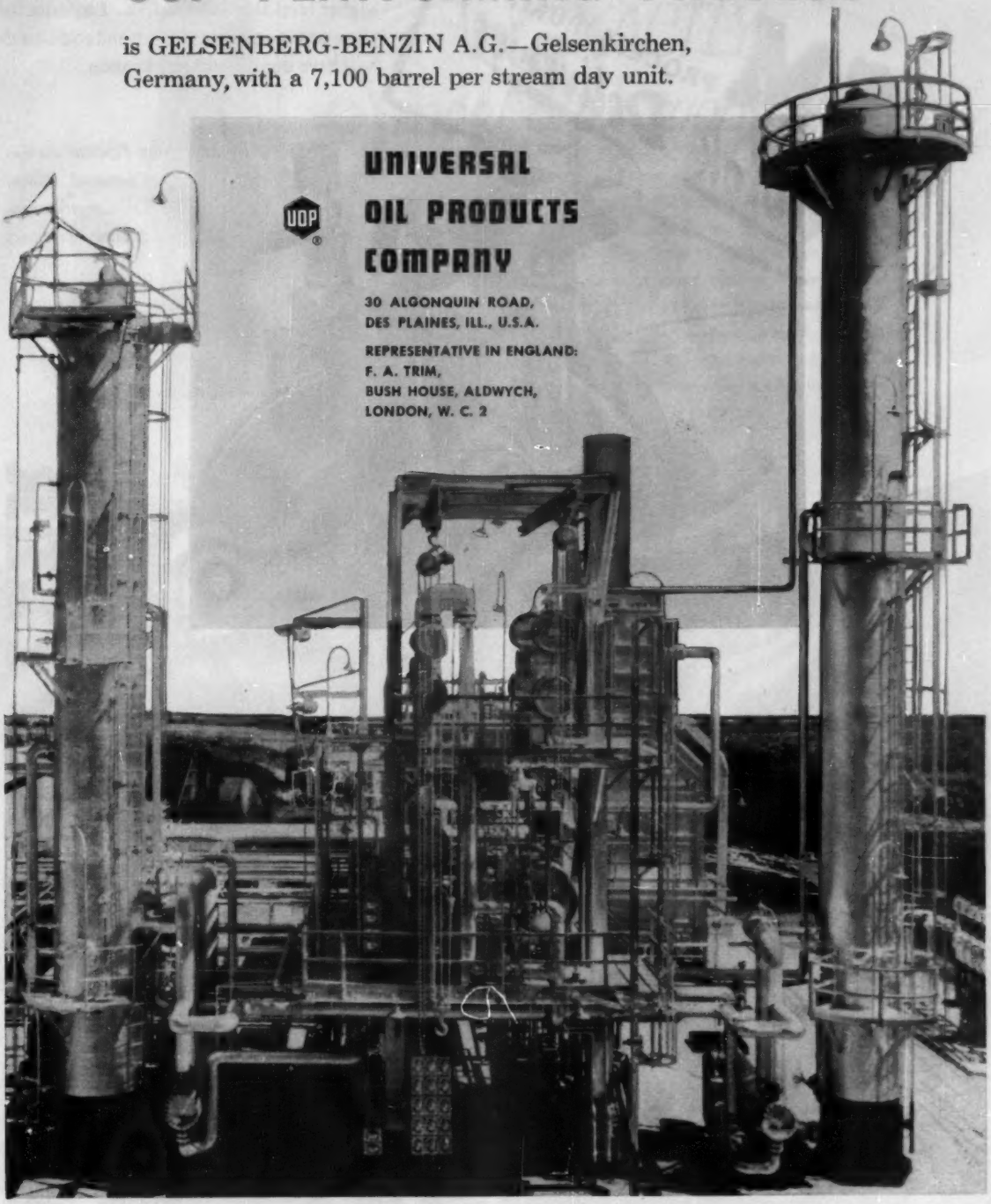

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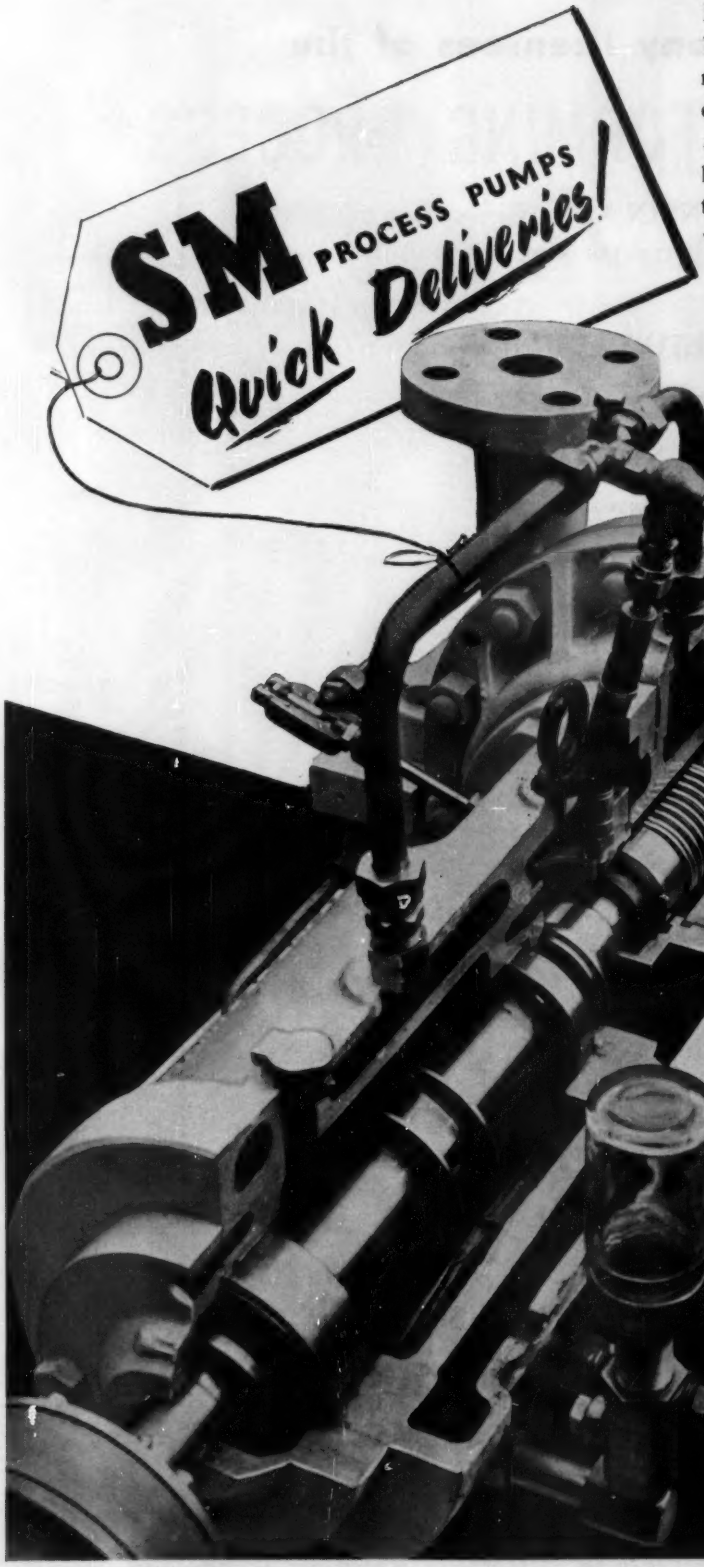

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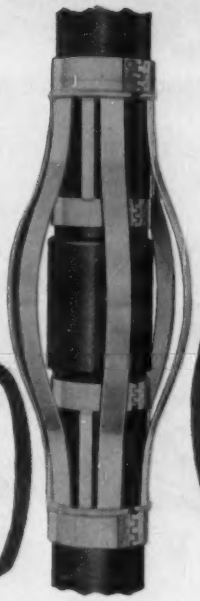

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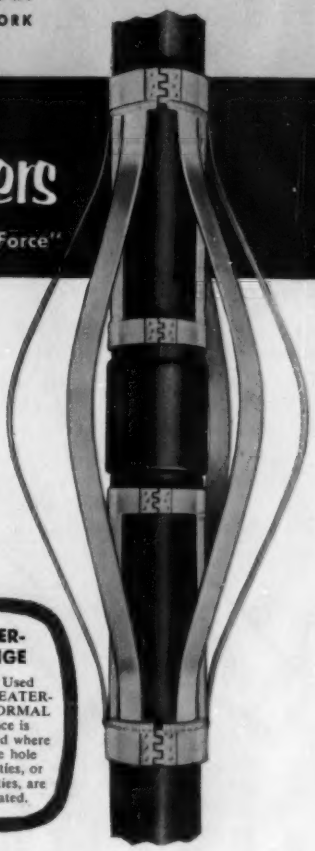

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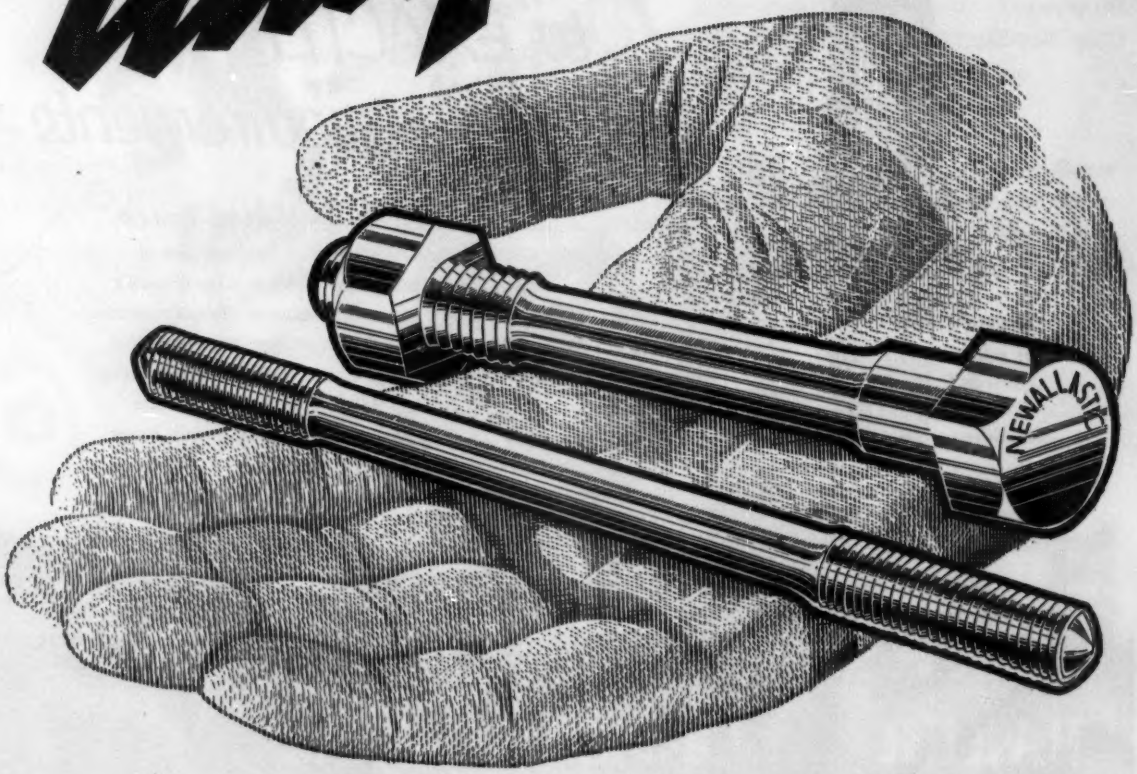

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